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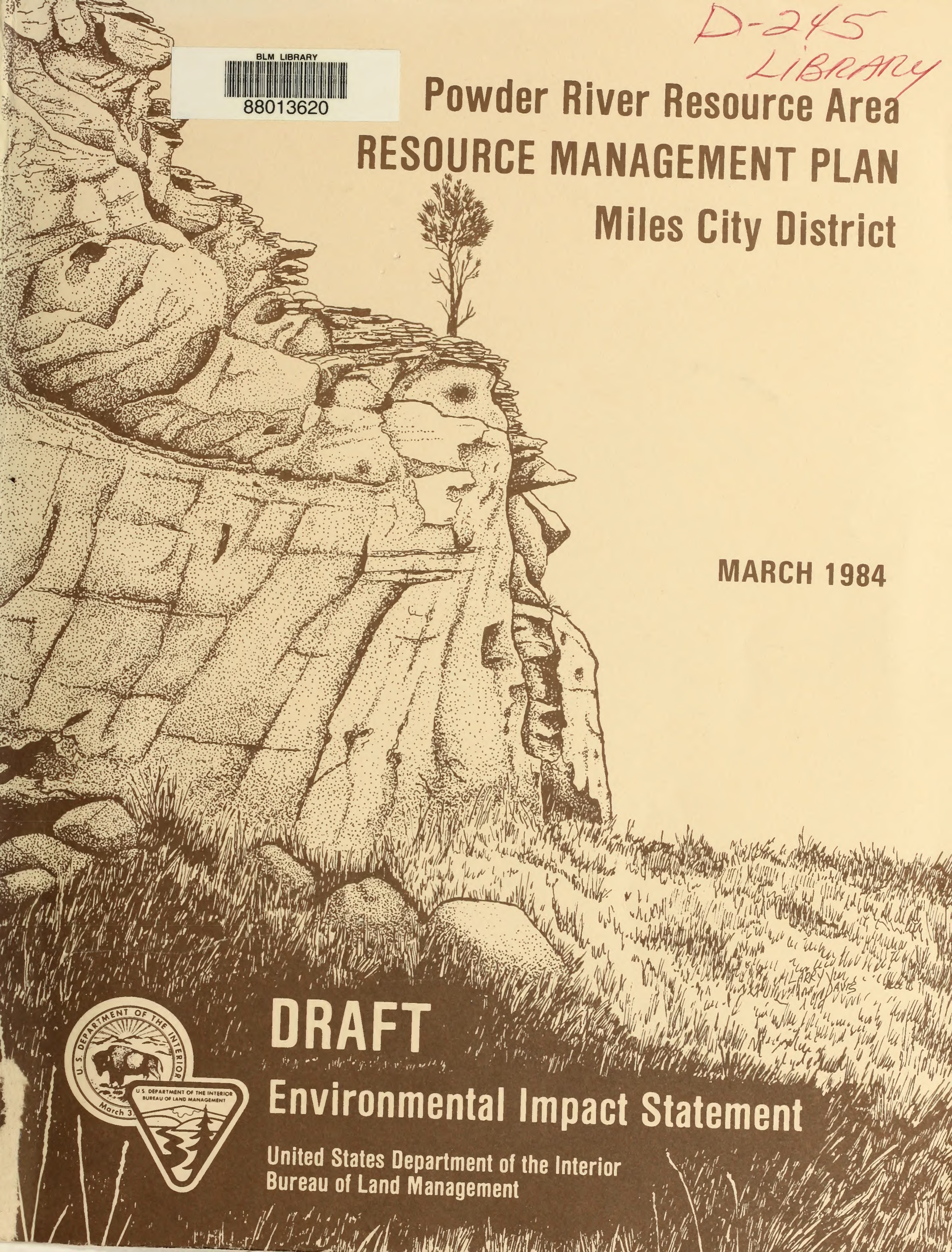
Powder River Resource Area
RESOURCE MANAGEMENT PLAN
Miles City District



MARCH 1984

DRAFT
Environmental Impact Statement

United States Department of the Interior
Bureau of Land Management

BLM-MT-ES-84-006-4410

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

IN REPLY REFER TO:

March 3, 1849

United States Department of the Interior
BUREAU OF LAND MANAGEMENT
Miles City District Office
P.O. Box 940
Miles City, Montana 59301

To the Reader:

This draft Resource Management Plan/Environmental Impact Statement (RMP/EIS) for the Powder River Resource Area is presented for your review and comment. This document outlines five major alternatives for managing the public land in the Powder River Resource Area. These alternatives are designed to resolve four land management issues that were identified during the early stages of the planning process.

We would appreciate your comments on this RMP/EIS by June 7, 1984. Questions or comments should be directed to Jay Guerin, Project Manager, Miles City District Office, BLM, P.O. Box 940, Miles City, Montana 59301.

Five formal public hearings have been scheduled to allow individuals to present testimony on the draft plan and EIS. These hearings are required for the wilderness suitability recommendations contained in this document, but testimony on all portions of the plan is encouraged. The hearings will be held at the following locations:

DATE	LOCATION	TIME
April 10, 1984	Multi-Purpose Room Carter County High School Ekalaka, Montana	All meetings will begin with a question and answer period at 7 p.m. and the formal hearing will follow at 8 p.m.
April 11, 1984	Community Center Broadus, Montana	
April 12, 1984	Room 106 Miles Community College Miles City, Montana	
April 17, 1984	Holiday Inn Sheridan, Wyoming	
April 18, 1984	Lunch Room Colstrip Jr. High School Colstrip, Montana	

All comments, whether written or oral, will be given equal consideration in the preparation of the final Resource Management Plan/Environmental Impact Statement. I hope that through your participation in this effort we can move together toward a common goal of improved public land management in the Powder River Resource Area.

Sincerely yours,

Michael J. Penfold

Michael J. Penfold
State Director

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RESOURCE MANAGEMENT PLAN/ ENVIRONMENTAL IMPACT STATEMENT

For The

POWDER RIVER RESOURCE AREA
MILES CITY DISTRICT, MONTANA

March 1984

Prepared By
Bureau of Land Management
Department of the Interior

Michael J. Penfold
State Director
Montana State Office

Bureau of Land Management
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Denver, CO 80225

RESOURCE MANAGEMENT PLAN ENVIRONMENTAL IMPACT STATEMENT

LEAD AGENCY: POWDER RIVER RESOURCE AREA
MILES CITY DISTRICT, MILES CITY, MONTANA
BUREAU OF LAND MANAGEMENT
DEPARTMENT OF THE INTERIOR

TYPE OF ACTION: Administrative

JURISDICTION OF ACTION: Powder River and Treasure Counties and portions of Rosebud, Carter, Big Horn and Custer Counties, Montana.

ABSTRACT: This document addresses future management options for the public lands and federal minerals administered by the Bureau of Land Management, Miles City District, Powder River Resource Area Office, located in Miles City, Montana. The plan focuses on alternative approaches to management of four key resource issues, which are coal development, vegetation utilization, land pattern adjustment, and wilderness. Four alternatives plus a preferred alternative derived from the four alternatives are considered in detail. The five alternatives are based on no action, development, preservation, and two multiple us theme's.

Comment Period: This is a draft Resource Management Plan/Environmental Impact Statement. It is open to public comment during the period March 9, 1984 through June 7, 1984. During April 1984, public meetings and hearings will be scheduled throughout the Resource Area for oral public comment. Times and places for these events will be announced through the area media. For information contact Ray Brubaker, District Manager, Miles City District BLM, P.O. Box 940, Miles City, Montana 59301. Phone (406) 232-4331.

Public comments should be addressed to:

Jay Guerin, RMP Project Manager
Miles City District, BLM
P.O. Box 940
Miles City, Montana 59301

SUMMARY

The Powder River Resource Management Plan (RMP) addresses future management for approximately 1,080,675 surface acres and 4,103,700 acres of federal mineral estate administered by the Bureau of Land Management (BLM) through its Powder River Resource Area office in Miles City, Montana. The Powder River Resource Area encompasses Powder River and Treasure Counties and portions of Rosebud, Carter, Big Horn, and Custer Counties in southeastern Montana.

The Powder River RMP provides a framework for managing and allocating public land and resources in the Resource Area during the next ten to 15 years. The RMP primarily focuses on resolving four key resource management issues. These issues are coal development; vegetation utilization among livestock, wildlife, and watershed; land pattern adjustment; and wilderness suitability of two wilderness study areas.

Five RMP alternatives are considered in detail. One represents no action, which means a continuation of present management direction. The other four provide a range of themes from favoring resource protection to favoring resource production. The preferred alternative, which is the proposed resource management plan, incorporates portions of the other four alternatives.

PREFERRED ALTERNATIVE

Future coal development would come from current leases covering 39,391 acres, 91,700 acres of unleased federal coal found acceptable for further consideration during past planning, and 862,500 acres found acceptable for further consideration in this RMP for a total of 993,591 acres. A total of 1.26 million acres were considered. Emergency leases to enable existing mines to maintain production or avoid a bypass situation would be issued on a case-by-case basis. Coal exchanges would be considered on a case-by-case basis. A wide selection of potential sites for coal leasing consideration is provided while areas with substantial multiple use conflicts are removed and protected. The approach allows future flexibility in meeting longterm energy needs. The lands selected for further consideration for leasing meet or exceed federal coal program requirements. Mining these lands would create environmental, economic and social impacts. Federal and state requirements for mitigation measures would have to be met to offset many impacts from mining and all mined lands would have to be reclaimed.

Vegetation utilization would allow for 233,387 animal unit months (AUMs) for livestock grazing and provide 700,161 AUMs for wildlife and watershed following the upgrading of 160,024 acres of public land in less than good condition and monitoring. Available vegetation for all uses would be up 12 percent over current levels with the increased vegetation on the 160,024 acres selected for improvement. The percentage of the Resource Area in good or better condition would increase from 70 percent to 85 percent. Improvements would be made through range developments, grazing management practices and some mechanical treatment of lands. The estimated cost of improvements is $6,465,960 over a 15-year period. About 5,000 acres of riparian vegetation would receive special management as wildlife habitat and a number of wildlife facilities would be constructed throughout the area. All range improvements would consider wildlife requirements and mitigation measures would minimize environmental impacts. Management would result in an overall long term improvement in ecological range condition, while providing for a balanced improvement of vegetation, wildlife habitat, and watershed. Individual grazing allotments are categorized for improvements, maintenance, or custodial care. Ranch operations would not be adversely affected because no grazing reductions are proposed.

A total of 165,054 acres of public land would be categorized with potential for disposal, with 75 percent targeted for exchange. Lands so categorized are primarily small, isolated tracts with no public access or significant resource values. Most lands would be considered for exchange to consolidate larger tracts, gain public access to other tracts and acquire lands with greater public resource value such as lands along major river drainages and reservoirs. Sales would be used to a lesser extent to reduce administrative costs and improve the land ownership pattern. Cumulatively, exchanges would result in beneficial impacts while sales at a low level would result in a small reduction of the public land resource. Transactions would only be made after applying a number of criteria which consider the environment and all resource values on each tract as it is proposed for disposal.

Zook Creek and Buffalo Creek wilderness study areas (WSAs) would be recommended as not suitable for wilderness designation. Future management would consider other resources and the WSAs would be managed the same as the rest of the Resource Area under this overall alternative. Current wilderness characteristics would be expected to decline slightly with continued multiple use. After fully studying and assessing the WSAs, neither Zook Creek nor Buffalo Creek were considered outstanding proposals for wilderness designation. Zook Creek possesses low wilderness values and Buffalo Creek possesses minimum wilderness values compared with other wilderness study areas. Wilderness manageability problems could arise from existing oil and gas leases at Zook Creek and at both areas from indirect conflicts with local coal development.

ALTERNATIVE A (No Action)

This alternative emphasizes a continuation of present management direction and would continue the present levels or systems of resource use and respond to the requirements of new regulations and policies.

Future coal development would come from current leases covering 39,391 acres and those unleased areas determined acceptable for further consideration in past planning covering 91,700 acres for a total of 131,091 acres. Emergency leases to enable existing mines to maintain production or to avoid a bypass situation would be issued on a case-by-case basis. Exchanges would be limited to existing leases, legislative direction, or leases located in alluvial valley floors. No new areas would be made available for further lease consideration. Mining would create environmental, economic and social impacts. Federal and state requirements for mitigation measures would have to be met to offset many impacts from mining and all mined lands would have to be reclaimed.

Vegetation utilization would continue with the existing 208,083 AUMs for livestock and 624,249 AUMs for wildlife and watershed. The current condition of the public land would be maintained with 70 percent remaining in good or better condition. Normal range developments would continue to be made throughout the Resource Area, with no attempt to upgrade range conditions. Current grazing management practices and mechanical treatments would continue. The estimated cost of maintenance or replacement improvements is $4,018,500 over a 15-year period. About 5,000 acres of riparian vegetation would receive special management as wildlife habitat and a number of wildlife facilities would be constructed throughout the area. All range developments would consider wildlife requirements and mitigation measures would minimize environmental impacts. Management would result in a static ecological range condition, providing existing vegetation for livestock, wildlife and watershed.

Adjustments to the land ownership would be made on a case-by-case basis. Based on a ten-year average, some 640 acres would be expected to be sold and 3,840 acres exchanged. There would be no special emphasis on land pattern adjustment and no categorization of lands for disposal. Any land transactions would involve criteria which consider the environment and all resource values on each tract as it is proposed for disposal. The small amount of lands involved would create minimal impacts, either adverse or beneficial. The large majority of resource area lands would remain in public ownership with minimal changes in pattern.

No suitability recommendation would be made for Zook Creek or Buffalo Creek WSAs. Present management for livestock grazing and wildlife would continue. Current wilderness characteristics would not be expected to change unless oil and gas leases result in development.

ALTERNATIVE B (Multiple Use)

This alternative emphasizes the management and production of resources with full consideration for multiple use values. Multiple use management would be directed toward providing a flow of renewable and nonrenewable resources from the public lands considering conflict with and mitigation measures for other resources.

Both the coal and vegetation utilization issues are the same as described in the preferred alternative.

A total of 165,054 acres of public land would be categorized with potential for disposal, with even consideration for sale or exchange. Lands so categorized are primarily small, isolated tracts with no public access or significant resource values. About half of the lands would be considered for exchange to consolidate larger tracts, gain public access to other tracts and acquire lands with greater public resource value such as lands along major river drainages and reservoirs. The other half of the disposable lands would be considered for sale to reduce administrative costs and improve the land ownership pattern. Exchanges at this level would result in beneficial impacts while sale at the same level would result in a sizeable reduction of the public land resource. Transactions would only be made after applying criteria which consider the environment and all resource values on each tract as it is proposed for disposal.

Zook Creek WSA would be recommended as suitable for wilderness and Buffalo Creek WSA would be recommended as not suitable for wilderness. Zook Creek would be managed as wilderness but some current commitments would have to be honored, including oil and gas leases. Future management of Buffalo Creek would consider other resources and would be managed the same as the rest of the Resource Area under this overall alternative. Current wilderness characteristics at Zook Creek would be preserved and those at Buffalo Creek would be expected to decline slightly with multiple use. Zook Creek, following a study and assessment of both areas, would be considered the better proposal for wilderness designation, with some wilderness provided in a multiple use alternative. However, wilderness manageability problems could result from indirect conflicts with local coal development.

ALTERNATIVE C (Resource Production)

This alternative emphasizes a dominant singular resource use instead of the full spectrum of multiple uses. Management would be directed towards providing a significant increase in the use of a few resources with a corresponding reduction in the multiple use balance.

Future coal development would come from current leases covering 39,391 acres, 91,700 acres of unleased federal coal found acceptable for further consideration during past planning and 957,200 acres found acceptable for further consideration in this RMP for a total of 1,088,291 acres. Emergency leases to enable existing mines to maintain production or avoid a bypass situation would be issued on a case-by-case basis. Coal exchanges would be considered on a case-by-case basis. This approach is designed to offer the widest selection of coal for future development that regulations and policy will allow. Using this approach only legally protected lands are removed from further consideration and the value of other multiple uses is considered offset by the value of the coal resource. The lands selected for further consideration for leasing meet the basic federal coal program requirements. Mining more of them would create greater environmental, economic and social impacts. Federal and state requirements for mitigation measures would have to be met to offset many impacts from mining and all mined lands would have to be reclaimed.

Vegetation utilization would allow for 319,269 AUMs for livestock grazing and provide 957,798 AUMs for wildlife and watershed following monitoring and the upgrading of 876,614 acres of public land to excellent condition and monitoring. Allocations for all uses would be up approximately 53 percent over current levels with the increased vegetation on the 876,614 acres selected for improvement. The percentage of the Resource Area in good or better condition would increase from 70 percent to 95 percent in excellent condition. Improvements would be made through range developments, grazing management practices and mechanical treatment of lands. The estimated cost of improvements is $18,043,680 over a 15-year period. About 5,000 acres of riparian vegetation would receive special management as wildlife habitat and a number of wildlife facilities would be constructed throughout the area. All range developments would consider wildlife requirements and mitigation measures would be used to minimize environmental impacts. Management would result in an overall long-term increase in vegetation production, providing for increased livestock grazing at the expense of some wildlife habitat. Individual allotments are categorized for improvement, maintenance, or custodial care, but allotments in both the improvement and maintenance category would be improved. Ranch operations would be provided the opportunity to expand.

A total of 165,054 acres of public land would be categorized with potential for disposal with 75 percent targeted for sale. Lands so categorized are primarily small, isolated tracts with no public access or significant resource values. Most lands would be considered for sale to reduce administrative costs and improve the land management pattern. Land sales at this level could result in federal revenues of about $12,000,000. Exchanges would be used to a small extent to consolidate larger tracts, gain public access to other tracts and acquire lands with greater resource value such as lands along major river drainages and reservoirs. Cumulatively, sales would result in a significant reduction of the public land resources. Exchanges at a low level would result in a minor opportunity to condolidate larger tracts, gain public access to other tracts and acquire lands with greater public resource value.

Wilderness proposals are the same as described in the preferred alternative.

ALTERNATIVE D (Resource Protection)

This alternative emphasizes a reduction in the use of resources and stresses the protection and enhancement of the natural environment.

Future coal development would be restricted to current leases covering 39,391 acres. Unleased federal coal found acceptable for further consideration during past planning would be dropped. No other lands would be recommended for further consideration, except emergency leases to enable existing mines to maintain production or avoid a bypass situation. These would be issued on a case-by-case basis. Exchanges would be only considered for existing leases, by legislation direction or for leases located in alluvial valley floors. Any new mines would be confined to state and private coal, those resulting from legislated exchanges, and to current leases.

Mining lands already leased would create environmental, economic and social impacts. Federal and state requirements for mitigation measures would have to be met to offset many impacts from mining and all mined lands would have to be reclaimed.

Vegetation utilization would consist of a targeted cut in livestock AUMs to 177,491 allocating 654,841 AUMs for wildlife and watershed. This cut would be based on monitoring. There would be 314,469 acres of rangeland upgraded to good condition from these livestock reductions coupled with range improvements, grazing management practices and some mechanical treatment of land. The estimated cost of improvements would be $6,465,960 over a 15-year period. These actions would result in a long-term availability of 232,608 AUMs available for livestock and 701,727 AUMs provided for wildlife and watershed. Livestock use AUMs would be adjusted as necessary after monitoring. Vegetation available for all uses would be approximately 11 percent over current levels, with the increased vegetation on the 314,469 acres. The percentage of the Resource Area in good or better condition would increase from 70 percent to 98 percent. About 5,000 acres of riparian vegetation would receive special management as wildlife habitat and a number of wildlife facilities would be constructed throughout the area. All livestock related range developments would be secondary to wildlife and watershed requirements. Mitigation measures would minimize environmental impacts. Management would result in an overall long-term improvement in ecological range condition, while also providing for enhanced wildlife habitat and watershed. Individual grazing allotments would be categorized for improvement, maintenance or custodial care; grazing reductions would involve all categories. Ranch operations would be adversely affected by proposed grazing reductions.

The lands issue is the same as described in the preferred alternative.

Zook Creek and Buffalo Creek WSAs would be recommended as suitable for wilderness designation. Both areas would be managed as wilderness but some current commitments would have to be honored, including oil and gas leases at Zook Creek. Current wilderness characteristics at both areas would be preserved. Both WSAs, following this study and assessment would be recommended as suitable for wilderness designation to protect the existing wilderness resource. Other resources, such as coal development, would not conflict with wilderness manageability under this alternative.

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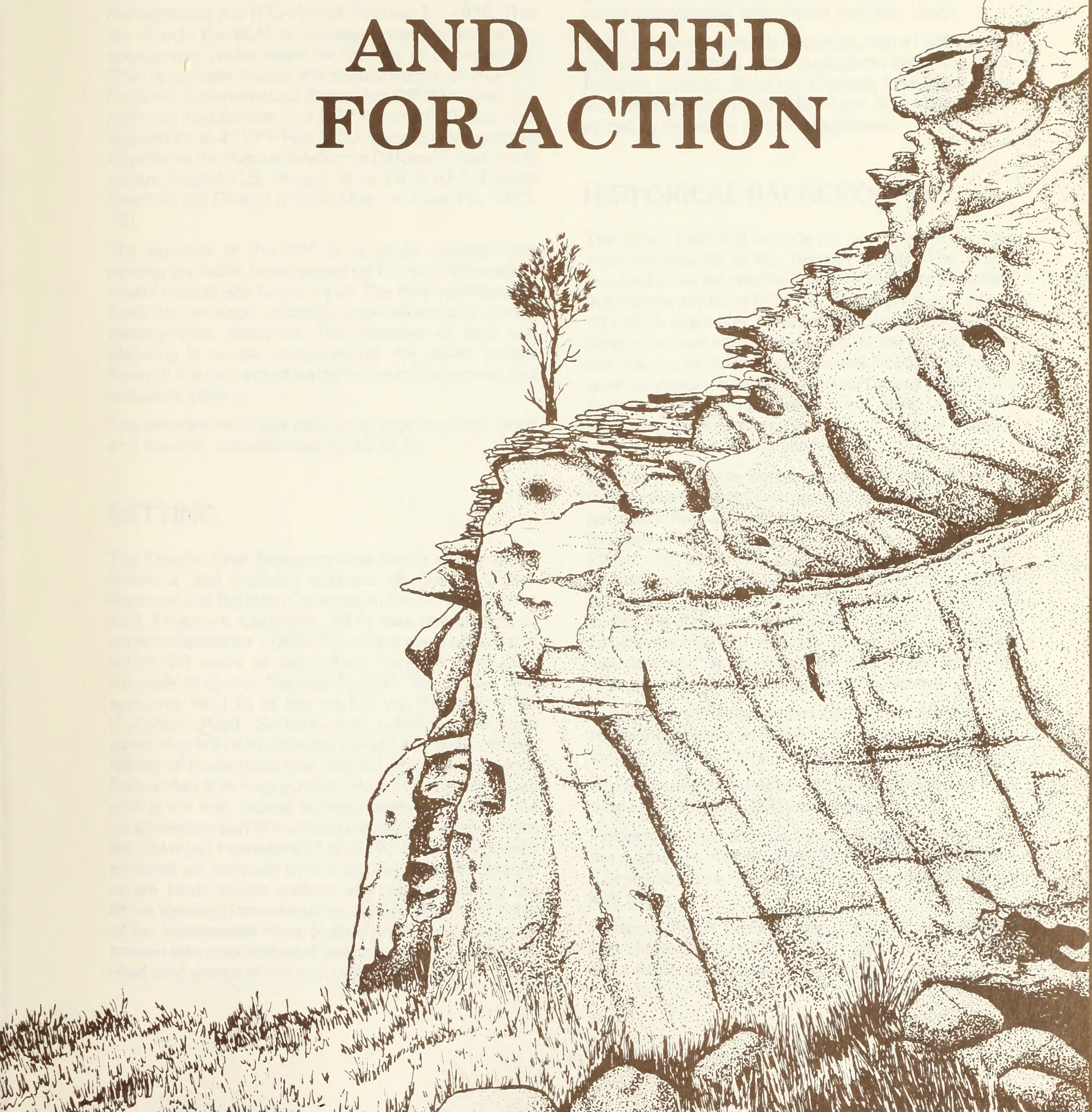
CHAPTER 1
PURPOSE OF AND NEED FOR ACTION



INTRODUCTION

The Powder River Resource Management Plan (RMP) describes general planning direction for the next 10 to 15 years on four issues in the Powder River Resource Area and analyzes the environmental effects of instituting such direction. It has been prepared in response to Section 202 and 603 (A) of the Federal Land Policy and Management Act (FLPMA) of October 21, 1976. This law directs the BLM to develop, maintain and, when appropriate, revise plans for the use of public lands. This document meets the requirements of FLPMA, National Environmental Policy Act (NEPA), land use planning regulations in 43 CFR Part 1600 and coal regulations in 43 CFR Part 3400. It also is responsive to litigation in the Natural Resources Defense Council et al versus Rogers C.B. Morton et al 1973 (U.S. District Court for the District of Columbia, ref. Case No. 1983-73).

The purpose of the RMP is to guide management actions on public lands based on current information, sound criteria and public input. The RMP provides the basis for resource utilization and defines and guides management decisions. The objective of land use planning is to use resources for the public benefit through the concept of multiple use management and sustained yield.

The alternatives in this plan apply only to public lands and minerals administered by the BLM.

SETTING

The Powder River Resource Area lies in southeastern Montana and includes portions of Custer, Carter, Rosebud and Big Horn Counties and all of Powder River and Treasure Counties. BLM has management responsibilities for 1,080,675 surface acres of land and 4,103,700 acres of subsurface minerals (including minerals in Custer National Forest). This public land accounts for 13% of the total in the Resource Area (Location Map). Surface and subsurface mineral ownership is in a fragmented pattern due to a complex history of homestead and railroad land grants (Lands Status Map is in map pocket). Most of the lands where coal is the only federal mineral reserved occur in the southwestern part of the Resource Area and result from the Enlarged Homestead Act of 1909. Lands where all minerals are federally owned are either public domain or are lands whose surface was patented under the Stock Raising Homestead Act of 1916. Within 60 miles of the Yellowstone River, federal mineral ownership is broken into checkerboard patterns resulting from railroad land grants at the turn of the century.

The primary economic uses of public lands in the resource area are agricultural rangeland and energy production. Other significant land uses include wildlife habitat, watershed and recreation. There are two Wilderness Study Areas (WSA's), Buffalo Creek in Powder River County and Zook Creek in Rosebud County.

Except for several concentrated blocks, most of the public lands in the Resource Area are small scattered tracts intermingled with private and state lands.

The major trade center is Miles City, with a 1980 census population of 9,586. Other population centers include Forsyth, Colstrip, Broadus, Ekalaka, Lamedeer, Ashland, Busby and Hysham. Sheridan, Wyoming is influenced by Resource Area Management.

HISTORICAL BACKGROUND

The oldest historical records are preserved in the geologic formations of the Resource Area. The oldest exposed rocks are marine shales, which were deposited in a shallow sea from 70 to 100 million years ago. About 70 million years ago, sand and silt carried from mountains to the west caused this sea to retreat eastward. The sea was replaced by swamps and floodplains where great dinosaurs such as Anatosaurus and Triceratops roamed. Several vertebrate fossil sites have been located in the Resource Area. The dinosaurs became extinct about 63 million years ago.

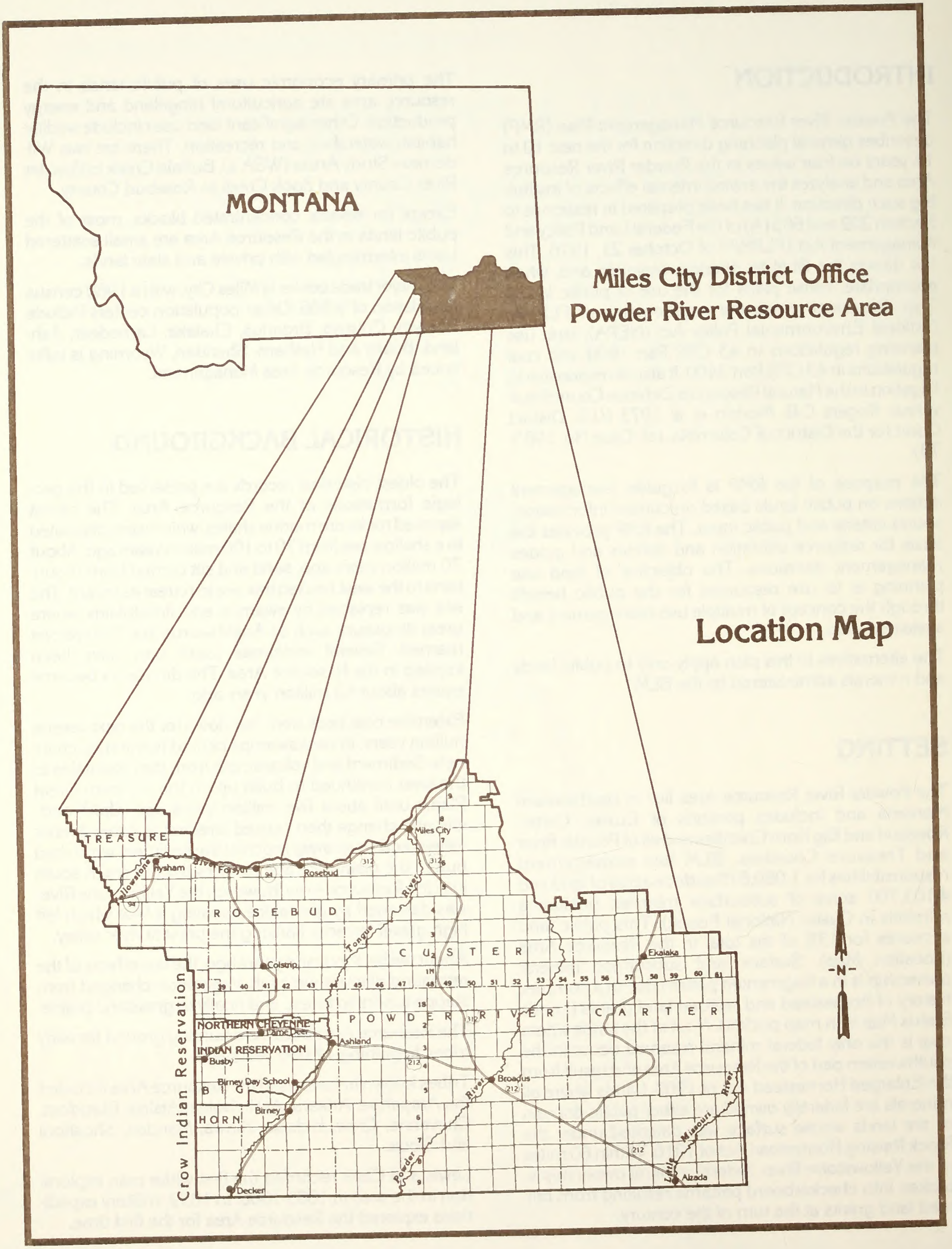
Extensive coal beds were laid down for the next several million years, in backswamps behind major river channels. Sediment and volcanic ash from the mountains to the west continued to build up on the northern Great Plains until about five million years ago. Uplift and climatic change then caused streams to carve deeper valleys and wash away much of the sediment which had buried the plains. Ice age glaciers did not reach south into the Resource Area; however, the Yellowstone River was dammed by glacial ice, creating a lake which left high gravel terraces flanking the present river valley.

About twelve thousand years ago, the last effects of the retreating glaciers were felt. Vegetation changed from steppe-tundra to forest, and finally to grassland prairie.

The Resource Area became a hunting ground for early tribes beginning 11,000 years ago.

Tribes known to have used the Resource Area included the Arapahoe, Arikara, Assiniboine, Atsina, Blackfoot, Cheyenne, Crow, Hidatsa, Kiowa, Mandan, Shoshoni and Sioux.

Lewis and Clark recorded the first white man exploration in the area in 1805-1806. In 1859, military expeditions explored the Resource Area for the first time.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Miles City District Office
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White settlement in the Resource Area began in 1876. The first ranches were established by 1880. The Resource Area became known for its livestock productivity and by 1886, the range was overstocked. Drought in the summer of 1886 and the extremely severe winter that followed caused the loss of 65-70% of the cattle on the open range. The disaster created awareness of carrying capacity of the range, and suggested early stock management practices.

By Act of Congress, the Northern Pacific Railroad was granted alternate sections of land in a corridor on each side of its right of way, creating the checkerboard ownership pattern in the northern part of the Resource Area. The railroad sold many of its lands to fund construction, and to bring settlers into the area to create new markets. This promotion, along with the Homestead Laws, brought many more people to the area. Homesteading peaked in the early 1920s. However, the effects of the droughts of 1915 and 1919, plus the Depression of the '30s caused marginal farm and livestock operations to fail, and ultimately reduced rural population.

In the meantime, with many settlers on the land, the open range was again becoming overgrazed. The Montana Stockmen's Association was formed to regulate the grazers. U.S. Government Grazing Permits originated as a way to control the number of people using a given area. The Mizpah-Pumpkin Creek Grazing Association, formed in 1926, was issued the first systematic grazing lease during 1928, and gave rise to the Taylor Grazing Act. This Act was the basis for the Grazing Service, which administered grazing on public lands until 1946. At that time the service was merged with the General Land Office to become the Bureau of Land Management, as we know it today.

PLANNING OVERVIEW

Several years ago, the BLM developed four management framework plans (MFPs) for portions of the Resource Area. The MFPs were the Decker-Birney, South Rosebud, Coalwood and Box Elder plans completed between 1973 and 1976. Activity in coal leasing resulted in the Powder River Resource Area Update Report in July 1979 and the Powder River Resource Area Amendment in May 1982. These two amendments dealt with federal coal in Big Horn, Rosebud, Powder River and Treasure Counties, refining the original MFP decisions.

Because of new legislation, changing policies and new land use problems, there is a need to consolidate, revise and update the decisions made in the old MFPs. This RMP replaces these MFPs and includes portions of the Resource Area not covered in previous planning. An environmental assessment of the potential impacts associated with land use proposals is a major portion of this plan.

The planning process described in the BLM planning regulations 43 CFR Part 1600 consists of nine steps.

Step 1. Identification of Issues

The public, other federal agencies, and state and local governments were asked to identify public land management issues in the Resource Area through mailouts and meetings. Public meetings were held in Birney, Forsyth, Hysham, Broadus, Ekalaka and Miles City during May 1980 and outside the Resource Area in Sheridan, Wyoming. A government interagency meeting was held in May 1980. BLM also identified issues and management concerns. This step led to the significant issues to be addressed.

Step 2. Development of Planning Criteria

BLM developed planning criteria to identify the considerations and constraints that would be applied to the analysis throughout the planning process.

Step 3. Inventory and Data Collection

Resource specialists reviewed base data from existing and updated inventories and completed new ones. Existing plans were also reviewed to analyze recommendations, decisions and directives for currency.

Step 4. Management Situation Analysis

This step analyzed the resources in relation to issues and concerns. It describes the resources that would be affected in the plan, explains how the resources are currently being managed and lists options for managing the resources. The Management Situation Analysis (MSA) also was used in developing the alternatives chapter (Chap. 2) and the affected environment chapter (Chap. 3). The complete MSA is on file for reference at the BLM Miles City District Office.

Step 5. Alternative Formulation

Options arising from the MSA were used to formulate a set of four initial alternatives. Management levels were developed to portray how the various resources would be used under changing program priorities. Specific actions proposed under each issue and alternative level were developed.

Step 6. Assessment of Alternatives

Resource specialists then described the environmental consequences of each level of resource use including biological, physical, economic and social effects.

This step is the environmental analysis required by the National Environmental Policy Act and is presented in Chapter 4.

Step 7. Selection of Preferred Alternative

The Preferred Alternative presented in Chapter 2 was formulated based on: (1) issues identified through the planning process; (2) criteria developed and considered by management; (3) public input on the initial alternatives; and (4) analysis of the impacts associated with the specific recommendations in each of the four alternatives. The Preferred Alternative is a fifth alternative. It was also analyzed for environmental impacts as described in Step 6 and is the primary focus of this document.

Step 8. Selection of Resource Management Plan

The eighth step is the plan selection and approval process. It will be completed following the assimilation of public comment on the Draft RMP and adopted following 30 days after the publication of the final RMP.

Step 9. Monitoring and Evaluation

The plan will be implemented according to the schedule included in the Record of Decision and final RMP. The implementation schedule will be subject to adjustment in relation to funding. Where additional information is needed for implementation, smaller more focused activity plans will be developed. The effects of implementation will then be monitored and evaluated. Standards will be developed to determine the adequacy of mitigation measures, the measurement of impacts, and whether significant changes in related federal, state, or local land use plans have been made. Monitoring and evaluation reports will be available for public review.

ISSUES

Results of an internal preplanning analysis, input from the public and coordination with other governmental entities suggested five major issues to be analyzed in depth. These issues, including planning questions and criteria, were made public with the mailing of 5,000 brochures on July 7, 1982. General comments on the brochure and consideration by an RMP steering committee reduced the major issues to four. The subject of rights-of-way corridors was dropped as an issue in favor of following coordination policies developed in cooperation with the State of Montana and the U.S. Forest Service.

Issue Number 1—Coal

Coal resources are plentiful in the Powder River Resource Area and can be managed in a way to help meet national energy development goals.

Large deposits of recoverable coal occur in the northern part of the Powder River Basin and industry has indicated an interest in its development. This interest as well as planning coal regulations requires BLM to consider making new areas available for lease as well as expanding the boundaries of coal areas already provided for through past planning documents.

There is concern by a segment of the people about the impacts of coal development and reclamation of mined lands.

Planning Questions

Which areas with coal development potential can be made available for further lease consideration?

Criteria

Areas acceptable for further coal lease consideration will meet the following criteria:

> Coal with development potential identified as acceptable following consideration of surface owner views,
>
> acceptable following application of unsuitability criteria, and
>
> acceptable following multiple use resource values including social and economic considerations.

Issue Number 2—Vegetation Utilization

Operators are dependent on livestock grazing provided by public lands. Multiple uses other than livestock grazing must be given due consideration. Consideration of vegetation utilization by livestock, wildlife and watershed protection can be used to benefit forage management.

Three management categories have been developed by the BLM for rangeland.

> 1) Maintenance Category—objective is to maintain current satisfactory resource condition and utilization levels.
>
> 2) Improvement Category—objective is to improve current unsatisfactory resource condition or to resolve vegetation use conflicts.

3) Custodial Category—objective is to manage allotments custodially while protecting existing resource values.

Planning Questions

What should be the balance between livestock grazing, wildlife habitat and watershed?

Which rangelands should be selected for maintenance, improvement and custodial care?

How will the balance of vegetation utilization affect the rancher?

Criteria

Vegetation is to be utilized by livestock, wildlife and watershed in a manner that will improve or maintain the vegetation and soil resources. Major consideration will be given to the five national criteria:

Range condition,
Resource potential,
Resource conflicts or controversy,
Opportunity for positive economic return on public investment,
Present management situation.

Issue Number 3—Lands

The scattered and complex pattern of public land presents an inefficient resource to manage.

Many of the scattered tracts of public land are not available for all multiple uses because of a lack of public access. There is also limited access to large bodies of water from public land.

Current resource values of the scattered public lands could be improved if the lands were consolidated or public access provided.

Planning Questions

What opportunities are available to reposition public lands and gain access to them?

What opportunities are available to obtain for public use, lands with high public value and lands bordering large bodies of water?

Criteria

Consideration will be given to the public values in repositioning public lands. This includes consideration of:

Ownership patterns,
Existing and potential uses of surrounding land,
Existing and potential access to lands,
Exchange possibilities,
Priority to gain access which will be given to those lands having significant existing or potential public values,
Incorporation of the principles of land pattern adjustment developed in Montana State Director guidance.

Issue Number 4-Wilderness

The RMP must analyze two wilderness study areas (WSAs) and make recommendations about their suitability for inclusion into the National Wilderness Preservation System (NWPS).

The Bureau is required to ascertain whether wilderness study areas are more important as wilderness than if retained and managed for any other resource and to make recommendations to the President for Congressional action.

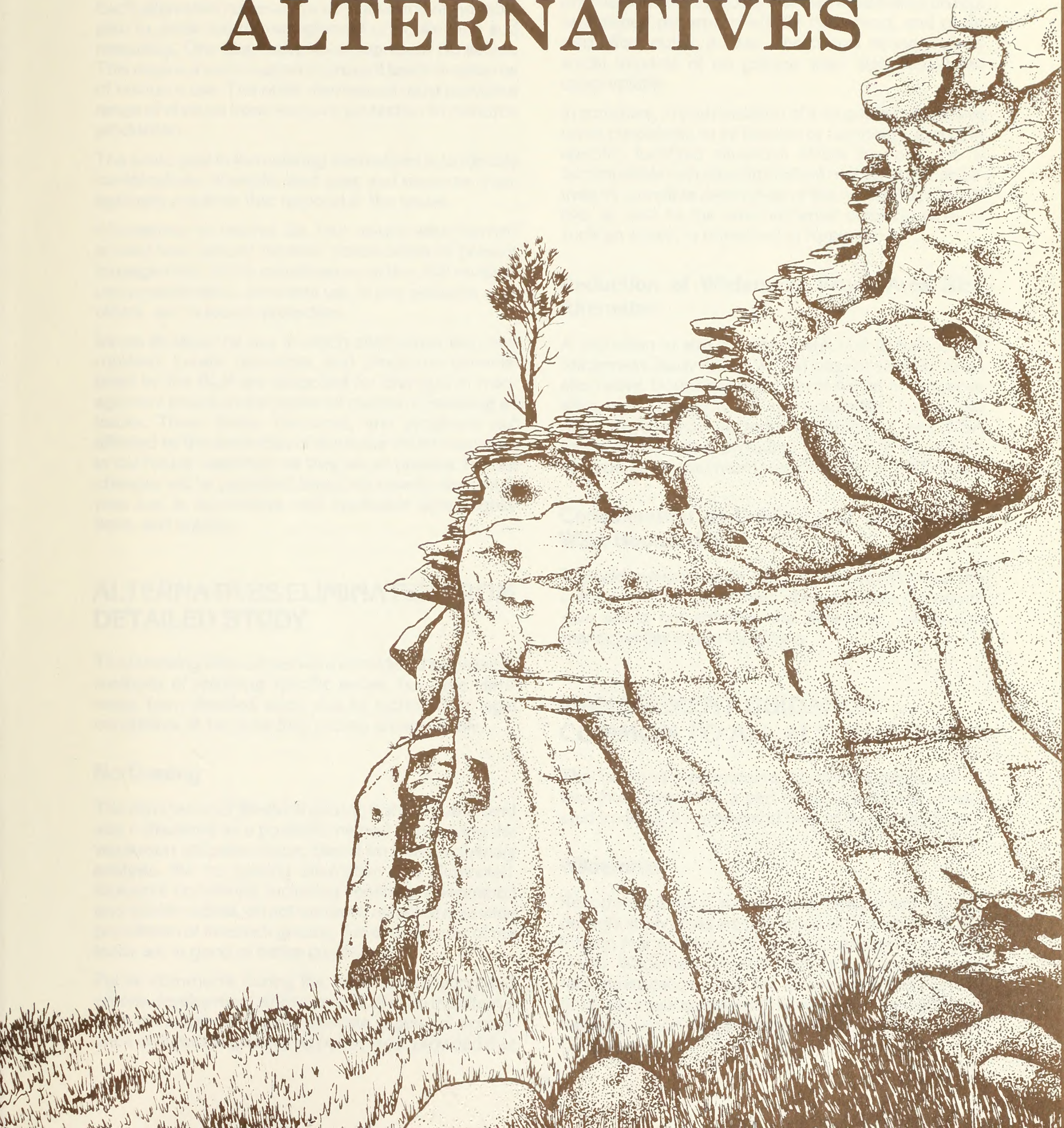
Planning Questions

Should the two wilderness study areas receive singular management attention because of their importance as a wilderness resource?

Criteria

A judgment based on each of the following will be made to aid in the decision to propose a wilderness study area for wilderness designation: (1) Extent of wilderness characteristics; (2) Value of energy and minerals, including coal, oil and gas resources; (3) Value of other resources, including range, timber, wildlife, recreation and watershed; (4) Manageability of wilderness values; and, (5) Public involvement. In addition, the suitability studies will be consistent with the BLM Wilderness Study Policy (Federal Register, 47:23 (2/3/82)).

CHAPTER 2
ALTERNATIVES



ALTERNATIVE FORMULATION OVERVIEW

Both the National Environmental Policy Act (NEPA) regulations and the BLM resource management planning regulations require the formulation of alternatives. Each alternative represents a complete and reasonable plan to guide future management of public land and resources. One alternative must represent no action. This means a continuation of present levels or systems of resource use. The other alternatives must provide a range of choices from resource protection to resource production.

The basic goal in formulating alternatives is to identify combinations of public land uses and resource management practices that respond to the issues.

Alternatives to resolve the four issues were formed around four general themes: continuation of present management, which constitues no action, full multiple use consideration, dominant use of one resource over others, and resource protection.

Issues dictated the way in which alternatives were formulated. Lands, resources, and programs administered by the BLM are proposed for changes in management based on the preferred means of resolving all issues. Those lands, resources, and programs not affected by the resolution of any issue will be managed in the future essentially as they are at present. Future changes will be permitted based on case-by-case analyses and in accordance with applicable laws, regulations, and policies.

ALTERNATIVES ELIMINATED FROM DETAILED STUDY

The following alternatives were considered as possible methods of resolving specific issues, but were eliminated from detailed study due to technical or legal constraints or because they proved unreasonable.

No Grazing

The elimination of livestock grazing from all public land was considered as a possible method of resolving the vegetation utilization issue. Based on interdisciplinary analysis, the no grazing alternative was eliminated. Resource conditions, including vegetation, watershed and wildlife habitat, do not warrant a resource area-wide prohibition of livestock grazing. Seventy percent of the lands are in good or better condition.

Public comments during the issue identification and criteria development stages, as well as from the alternatives development period, indicate a general acceptance of livestock grazing on public land, provided that such grazing is properly managed. No significant use conflicts were identified.

The highly fragmented pattern of public lands in the Resource Area would necessitate extensive fence construction and maintenance, if livestock were to be effectively excluded from public land. Fencing would not only be prohibitively costly, but also would likely disrupt established patterns of wildlife movement, and could also affect public access. The overall economic and social impacts of no grazing were also considered unacceptable.

In summary, implementation of a no grazing alternative is not considered to be feasible or necessary, except in specific, localized situations where livestock use is incompatible with more important management objectives. A complete description of the no grazing alternative, as well as the environmental consequences of such an action, is contained in Appendix A.

Reduction of Wilderness Study Area Size Alternative

A reduction in size of Zook Creek and Buffalo Creek Wilderness Study Areas (WSAs) was not analyzed as an alternative. Boundary adjustments would not improve wilderness suitability or manageability, nor would resource conflicts be reduced. Buffalo Creek WSA totals 5,650 acres providing little room to reduce acreage, as the minimum study area size is 5,000 acres.

Consideration of Public Land Outside the WSA Boundaries

The wilderness inventory showed any extensions of the areas would lack wilderness characteristics. So expansion would not enhance the wilderness values and manageability within the WSAs.

MANAGEMENT GUIDANCE COMMON TO ALL ALTERNATIVES

The following management guidance is applicable to, and thus constitutes a part of, all alternatives considered in detail. It is presented here to avoid repetition.

Wilderness

Recommendations and analyses dealing with the wilderness study areas are presented as though the BLM's Interim Management Policy and Guidelines for Lands Under Wilderness Review were not a factor. Some recommendations may not be implementable unless the study areas are released from interim management following a non-designation of wilderness decision by Congress.

Minerals

Private industry is encouraged to explore and develop federal minerals to satisfy national and local need. This policy provides for economically and environmentally sound exploration, extraction and reclamation practices. Public lands are open and available for mineral exploration and development unless withdrawn or administratively restricted. Mineral development may occur along with other resource uses. Programs to obtain and evaluate current energy and mineral data are encouraged.

Saleable Minerals

The resource area will meet the demand for these resources through sales or free use permits on a case-by-case basis, as in the past.

Locatable Minerals

Mineral exploration and development in the Resource Area will continue to be administered through existing surface and mineral management regulations (43 CFR 3809 and 43 CFR 3800).

Oil and Gas Exploration and Development

The 1980 Programmatic Environmental Assessment (EA) of the BLM oil and gas leasing program in the Miles City District is the policy document for oil and gas activity management in the Resource Area. Alternatives, the proposed action and no leasing, were considered in the EA. See Appendix P for a summary of impacts. Exploration and development on public lands will continue to be managed in accordance with this document. Additional EA responsibilities originally assigned to the U.S. Geological Survey were transferred to the BLM during 1983.

BLM is responsible for the protection of federal surface during seismic exploration and well drilling. Companies are required to post bond to ensure proper reclamation. BLM also issues oil and gas leases and evaluates geological, engineering, and economic aspects of drilling activity to ensure resource protection and proper collection of revenues.

Leasing

Oil and gas leases fall into two basic categories—competitive and noncompetitive. Competitive leases are issued in Known Geological Structures (KGSs) which are areas known to contain producible oil and gas deposits. Noncompetitive leases are issued for lands outside KGSs and are available as a result either of open over-the-counter offers or simultaneous filings.

KGS land may be offered for competitive leasing based on response to public request or Bureau initiative. If this occurs, the BLM then prepares a report as to KGS status, determines whether competitive leasing is in the public interest, and groups tracts into lease parcels. If leasing is recommended, land nominated by the public is combined with other BLM nominations (in active KGS areas), and a competitive lease sale is scheduled. The BLM offers the tracts for lease through competitive sealed bids. The adequacy of the high bids tendered is determined by a bid evaluation team composed of representatives from BLM. Each sealed bid must be accompanied by an initial payment of 20% of the bonus offered; the remaining bonus payment must be paid prior to lease issuance.

On noncompetitive leases, the applicant files an offer to lease on lands open to lease in non-KGS areas. If, through adjudication, the lands are available for lease, the BLM district office or other appropriate surface management agency responds with appropriate land use recommendations and, upon approval, a ten year lease is issued to the applicant.

Previously leased parcels in non-KGS areas (i.e., simultaneous and noncompetitive filings) are listed monthly as they become available following expiration, cancellation, or termination of the old leases. Once a list of available tracts is approved and advertised, all applications received during the filing period are considered to have been filed simultaneously. An applicant may file only one application per tract, accompanied by a $75 filing fee. A drawing is held and three applications are drawn for each tract. A lease is offered on the parcel in the order in which they were drawn (i.e., a winner and two alternates).

All leases require rent payment in advance. Rent on leases issued over-the-counter is $1.00 per acre per year. Leases issued pursuant to a simultaneous filing rent for $1.00 per acre per year for the first five years and $3.00 per acre per year for each remaining year. For competitive leases, an annual rental of $2.00 per acre is charged. Upon production of oil and gas, the royalty charge varies from 12.5% to 25% of value, depending on the production volume. Prior to drilling, the lease holder or designated operator must secure bond to insure compliance with all terms of the lease. Rent and royalty schedules on competitive leases are described in the lease agreement.

The BLM has responsibility to assure full compliance with the spirit and objectives of the National Environmental Policy Act (NEPA) of 1969, the Federal Land Policy and Management Act of 1976, other federal environmental legislation, and supporting Executive Orders and regulations concerning oil and gas development.

Duties prior to issuing leases include application of standard stipulations to cover most items necessary to protect and subsequently rehabilitate the surface resource. If additional stipulations are required, they are formulated and included prior to lease issuance.

After lease issuance and prior to approval of any surface disturbing activities within the area of the lease, a detailed site-specific review and field examination is conducted by BLM and any additional surface administering agency. From this effort, site-specific requirements are formulated for the protection of the surface resources and subsequent rehabilitation, and imposed upon the lessee prior to approval of the proposed activity (i.e., geophysical work, well drilling). Although BLM has prime responsibility at this point, it must have full concurrence from any other surface managing agency. If differences exist, these are forwarded through various administrative levels and eventually to the Secretary.

To better understand oil and gas leasing operations, the following discussion describes BLM responsibilities in each phase of the operation.

Exploration

There is no statutory authority for oil and gas exploration. Subpart 3045 of the Code of Federal Regulations (1983) established procedures to be followed for surface activities.

Before geophysical operators conduct any operations on public lands, they are required to file a "Notice of Intent" with the District Manager, BLM.

The geophysical operator has a responsibility to cooperate and coordinate his operation with the District Manager. The operator's responsiblities are to:

File a Notice of Intent on unleased lands, with maps showing proposed seismic lines and all necessary access routes before operations begin. The map should be a minimum scale of 1/2 inch to the mile.

Be bonded.

Notify the District Manager before he enters onto public lands.

Obtain the District Manager's written approval for bulldozer or other dirt work.

Notify the District Manager in writing of any changes in the original notice and secure written approval before proceeding.

Comply with stipulations imposed by the District Manager at the pre-work conference and during field investigations.

File a Notice of Completion.

The District Manager's responsibilities are to:

Examine resource values and develop appropriate surface protection and reclamation measures.

Conduct compliance inspections.

Coordinate with the geophysical operator to explain the terms of the Notice of Intent, including operating practices to be followed or avoided, all relevant laws, and BLM administrative requirements.

Complete final inspection after the Notice of Completion is filed. The inspection must determine that all instructions were compiled with and all rehabilitation practices completed. A 30-day limit for the final inspection and notification of additional work is established by regulation. If further instructions are given to the operator at final inspection, an additional 30-day limit is established for the BLM after notification that the operator has completed the work.

Operations

Once a federal lessee or designated operator indicates that he wishes to explore on or develop a lease, all proposed drilling operations and related surface disturbance activities must be approved before entry upon the lands involved. Standard lease stipulations are listed in Appendix B. Approval will be in accordance with: (1) lease terms, including any additional lease stipulations, and (2) Title 30 CFR Part 3160, "Onshore Oil and Gas Operations". The requirements that must be approved include the following:

Application for Permit to Drill. Prior to drilling (or road construction) on a federal lease, the operator must submit an Application for Permit to Drill (APD). The APD includes a Surface-Use and Operations Plan. Where private surface is involved, it should include a copy of the written agreement between the lessee or operator and the surface owner. A letter from the lessee or operator setting forth rehabilitation requirements agreed to with the surface owner is acceptable.

The APD provides operational and geologic information required by the BLM. The Surface-Use and Operations Plan must allow assessment of the environmental effects expected from the proposed project. Bonding coverage must be obtained by the applicant before approval of the APD by BLM.

BLM prepares surface-protection stipulations for the approved permit. The BLM must decide at this time if it desires to obtain the well as a water well if oil or gas is not encountered in usable quantities.

Approval of Operations. Before repairing, deepening, or conditioning an existing well, a detailed written work plan must be submitted to BLM.

In existing fields, operators are required to submit, for BLM approval, plans for new construction, reconstruction, or alteration of existing facilities when additional surface disturbance will result.

Abandonment. Well abandonment requires prior approval by the BLM, which may require additional surface rehabilitation. These requirements are normally part of the approved abandonment plan. Abandonment will not be approved until surface rehabilitation work required by the drilling permit or abandonment notice is complete, and required vegetation is established to the satisfaction of the BLM District Manager.

Water Well Conversion. If the BLM decides to acquire the well as a water well, it must assume responsibility at the time of abandonment. The operator will plug the well at the bottom of the desired fresh-water zone and leave casing in place. The operator then will begin surface cleanup as required. The BLM must reimburse the operator for all costs in excess of the normal plugging costs.

Map 2-1 shows areas open to oil and gas leasing, open with special stipulations and open with no surface occupancy in the Resource Area. No areas are closed to leasing.

It is impractical to mitigate impacts on a site-by-site basis in the RMP due to the geographic scope of this assessment. Consequently, many of the mitigating measures in the Programmatic Environmental Assessment will not apply to all sites. Instead, these measures apply to those areas exhibiting environmental features that are Sensitive or Critically Sensitive to oil and gas activity (e.g. fragile soils, endangered species, etc.). In the Resource Area, stipulations at the time of lease are proposed by area personnel. The Surface Protection Specialist and Resource Specialists attach mitigation to individual drilling permits at the time of the predrill inspection by utilizing the range of measures proposed in the Programmatic EA necessary to protect the features found in the area.

Appendix B presents the existing standard BLM stipulations package. This package represents an effort to develop a listing of the most often used mitigating measures. For that reason, the reader should note that Appendix B does not contain a complete listing of mitigating measures.

Special lease stipulations limit the lessee's normal enjoyment of the lease. Examples are when portions of the lease cannot be occupied or cannot be used during certain parts of the year for wildlife, watershed, or other reasons or when certain roads cannot be used, etc., or when special situations are evident at the time of lease issuance which will require unique or unusually expensive steps by the lessee. Special situations could involve extremely unstable formations, extremely high pressure water flows, or identified critical habitat for threatened or endangered species.

Stipulations for normal environmental situations such as access road location, design, and construction; construction materials; drill site and development facilities layout and construction; waste disposal; water supply; and protection or recovery of cultural resources; proper engineering techniques; visual resource considerations; steps necessary for quick and successful reclamation, wildlife habitat protection, facility location, required soil or water testing; etc., will be covered during the lease development stage in the Application for Permit to Drill (APD) required by Operating Order #1 and Operating Plan required by NTL #6.

Methods of seedbed preparation and seed mixtures can be left open until the time the actual rehabilitation operation is begun. However, where special species such as hard to find native seed, special seedings, or tree or shrub planting are anticipated, it should be stipulated at the time of approval of the Application for Permit to Drill.

The need for using special stipulations must be supported in the Programmatic EA by including documentation with the recommendation for the stipulation's use. This documentation will be included in the lease file.

Vegetation Monitoring and Evaluation

The decisions outlined in the Powder River RMP will be implemented over a period of 15 years or more, depending on the availability of funding and manpower. The effects of implementation will be monitored and evaluated on a periodic basis over the life of the plan. The general purposes of this monitoring and evaluation will be:

(1) To determine if an action is fulfilling the purpose and need for which it was designed, or if there is a need for modification or termination of an action.

(2) To discover unanticipated and/or unpredictable effects.

(3) To determine if mitigation measures are working as prescribed.

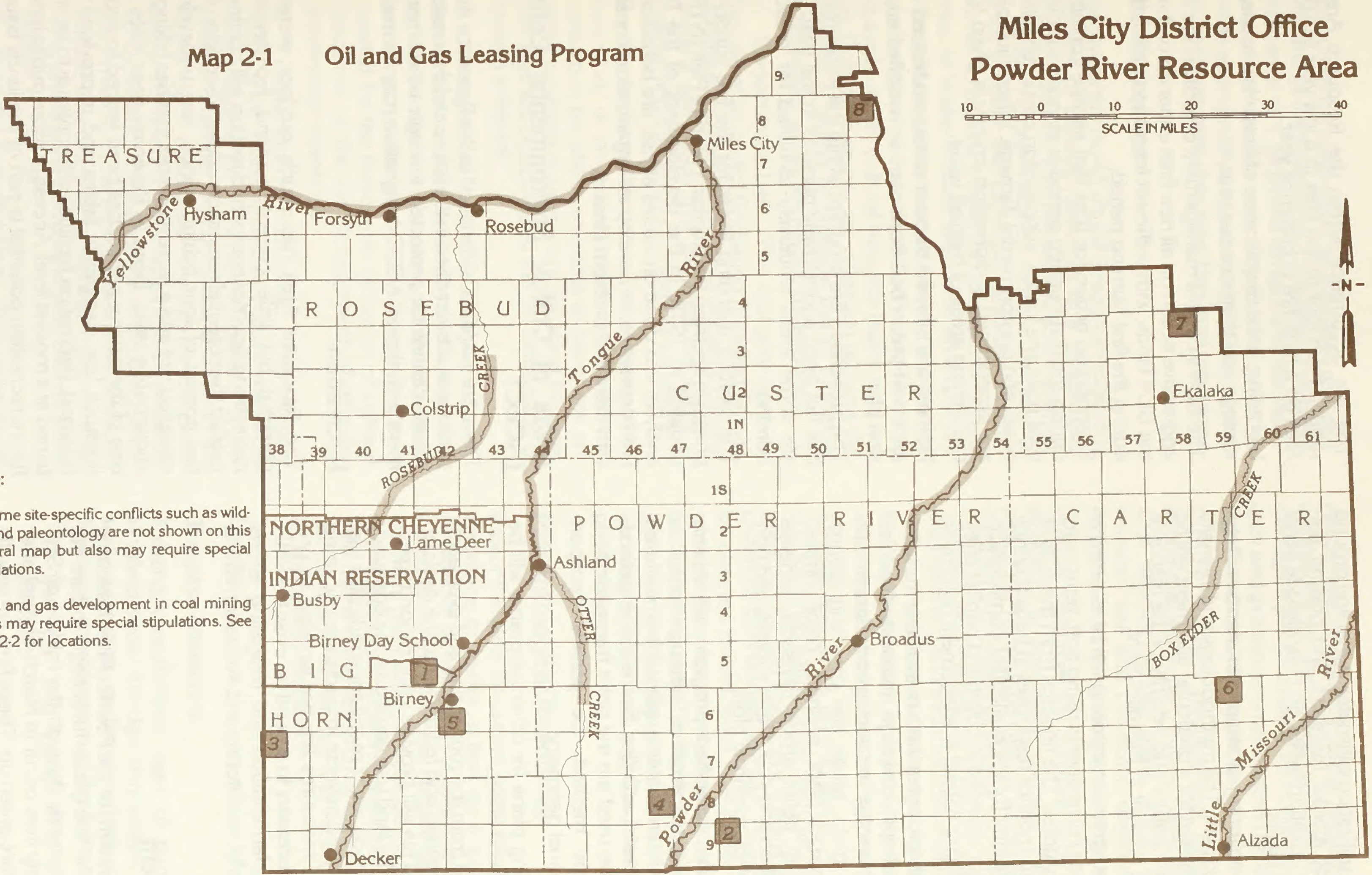
(4) To ensure that decisions are being implemented as scheduled.

(5) To provide continuing evaluation of consistency with state and local plans and programs.

(6) To provide for continuing comparison of plan benefits versus costs, including social, economic, and environmental.

A specific monitoring plan will be written for the wildlife, watershed, and range programs. This plan will provide a framework for choosing the study methods that will provide the information needed to issue and implement specific management decisions which effect watershed, wildlife, and range. Monitoring efforts will focus on allotments in the improve category. For the range program, methodologies are available for monitoring vegetative trend, forage utilization, actual use (livestock numbers and periods of grazing), and climate. The data collected from these studies will be used to evaluate current stocking rates, to schedule pasture moves by livestock, to determine levels of forage competition, to detect changes in plant communities, and to identify patterns of forage use. Some of the methodologies that could be used include: Daubenmire canopy transects, Lommason utilization transects,

Map 2-1 Oil and Gas Leasing Program



Note:

Some site-specific conflicts such as wildlife and paleontology are not shown on this general map but also may require special stipulations.

Oil and gas development in coal mining areas may require special stipulations. See Map 2-2 for locations.

Sensitive Areas Requiring Special Stipulations Shown as Shaded Lines Along Major Drainages (288,000 acres)

Wilderness Study Areas Requiring Non-impairment Clauses
1. Zook Creek WSA
2. Buffalo Creek WSA

Sites Which May Require No Surface Occupancy Clauses
3. Rosebud Battlefield
4. Reynolds Battlefield
5. Battle Butte Battlefield
6. Finger Buttes Scenic Area
7. Medicine Rocks State Park
8. Critical Bighorn Sheep Habitat

key forage plant utilization estimates, aerial and ground reconaissance of animal numbers and grazing patterns, actual use questionnaires, and low altitude aerial photography transects.

Priorities for monitoring grazing allotments will be established in this plan. The methodology and intensity of study that is chosen for a particular allotment will be determined by the nature and severity of the resource conflicts that are present in that allotment.

For the wildlife program, monitoring will be directed at the biotic resource components using both temporary and permanent studies. The findings from these studies can be used to monitor responses in habitat condition and trend; monitor forage availability, composition, and vigor; monitor changes in cover and habitat effectiveness; and monitor habitat management objectives.

Some of the methodologies that are available include:- Daubenmire canopy coverage transect, modified browse canopy coverage transect, woody riparian surveys and photo plots, range site condition ratings, height/weight grazed plant method, color infrared aerial photography, pellet group transects, fisheries species composition and population surveys, and non-game bird and small mammal plots.

Monitoring for the watershed program will mainly involve monitoring soil erosion, although trends in streambank stability and water quality will be monitored for mining and forestry activities. Some of the methodologies that can be used are the point frame method, the sediment trap method, the particle transport method, and channel geometry.

Specific monitoring plans for other programs will be developed if the need arises.

The data collected from the monitoring and evaluation process will be analyzed and fed back into the decision making process. This will provide information regarding the effects of the land use decisions, the adequacy of mitigation methods, etc. If monitoring indicates that significant unexpected adverse impacts are occurring or that mitigating measures are not working as predicted, it may be necessary to amend or revise the RMP. Conversely, if implementation and mitigating efforts are highly successful, monitoring and evaluation efforts may be reduced.

Fire Management

The normal fire season for the Powder River Resource Area starts when the fine grassy fuels begin to cure out in early July and extends through the middle of September. Some early fires occur in March or April after snowmelt and before green-up. These fires are usually of low intensity, but they can have a high spread rate. During the normal fire season, the fires become more intense when their location is in heavier, forested fuel types.

The fire occurrence within the Resource Area has ranged from four to five fires in a low year to 18 to 20 fires on a high fire occurrence year.

Lightning is the major cause of fires. Man-caused fires average less than one per year.

The BLM's current management objectives are to take aggressive action on all new fires either on or threatening BLM lands, with sufficient forces to contain the fire during the first burning period.

Suppression action for fires that escape containment during the first burning period is planned to minimize total resource losses, suppression costs, rehabilitation costs, and environmental damage. When multiple fires are experienced, suppression priority is given to fires threatening areas of highest value.

No fires are allowed to burn unless addressed by an approved prescribed burn plan or modified suppression plan.

The prescribed fire program within the Resource Area has not been aggressively pursued in the past. There are some areas tentatively identified for prescribed burning.

The existing manning levels for the fire suppression program are from the Normal Year Fire Plan (NYFP) as updated in 1978. In the development of the NYFP, analysis was done on values at risk, fire behavior, and fire occurrence, to develop an organization consistent with identified problem classes.

Areas of Critical Environmental Concern (ACEC)

There are no ACECs identified in the Resource Area. If such areas are identified in the future and their resource values cannot be protected through other management techniques, ACEC designation may be made.

Recreation

The Resource Area has much outdoor recreation potential but little current demand for developed recreation sites. Management direction will continue to protect the potential recreation values. Recreation facilities consist of four fishing ponds, one undeveloped camping site and a recreation area that has hiking and snowmobile trails. Dean S. Reservoir near Miles City, one of the fishing ponds, has been fenced to exclude livestock use, has picnic tables and is provided with firewood. Recreation facilities will continue to be maintained at a modest level. Access to more public land for future recreation potential is part of the lands issue.

Restrictions and closures to off-road vehicle use will be established for specific roads, trails, or areas only where problems have been identified. Areas not designated as restricted or closed will remain open for motorized vehicle use.

Visual resources will continue to be evaluated as a part of activity and project planning. Evaluation considers the significance of a proposed project and the visual sensitivity of the affected area. Stipulations are to be attached as appropriate to assure compatibility of projects with management objectives for visual resources.

Cultural Resources

The objective of the BLM Cultural Resource Program is management of cultural resources in a stewardship role for public benefit. This objective is accomplished, in part, through a use-evaluation system designed to analyze the scientific and sociocultural values of cultural resources, to provide a basis for utilization of cultural resources, to make cultural resources an important part of the planning system, and to identify information needed when existing documentation is inadequate to support a reasonable cultural resource based land use decision. Cultural resource use utilization requires the consideration of actual or potential use of individual sites or properties within the following categories:

1. Sociocultural Use. This category refers to the use of an object (including flora and fauna), structure, or place based on a social or cultural group's perception that the item has utility in maintaining the group's heritage or existence.

2. Current Scientific Use. This category refers to a study or project in progress at the time of evaluation for which scientists or historians are using a cultural resource as a source of information that will contribute to the understanding of human behavior.

3. Management Use. This category refers to the use of a cultural resource by the BLM or other entities interested in the management of cultural resources, to obtain specific information that is needed for the reasonable utilization of cultural resources or for the development of effective preservation measures.

4. Conservation for Future Use. This category refers to the management of cultural resources by segregating them from other forms of appropriation until specific conditions are met in the future. Such conditions may include the development of research techniques that are presently not available or the exhaustion of all other resources similar to those represented in the protected sample. The category is intended to provide long-term, onsite preservation and protection of select cultural resources.

5. Potential Scientific Use. This category refers to the potential use (utilizing research techniques currently available) of a cultural resource as a source of information that will contribute to the understanding of human behavior.

Actual use of public cultural resources by qualified institutions is authorized and monitored by BLM through a permit system. BLM will continue to investigate and prosecute unauthorized use or destruction of significant cultural properties.

Cultural resource management objectives are also accomplished, in part, through development of site or area specific activity plans which identify cultural resource use and protection objectives, and outline procedures for evaluating accomplishments.

Cultural resources will continue to be inventoried and evaluated to adequately consider the effects of proposed BLM actions on cultural properties which may be eligible for the National Register of Historic Places. This inventory and evaluation is routinely a part of project level planning and includes consultation with the State Historic Preservation Office and Advisory Council on Historic Preservation as appropriate. Cultural resources will be evaluated against the National Register criteria.

As time and funds permit, the BLM will continue to conduct inventories under the Cultural Resource Program to find and document cultural properties which qualify for the National Register. These later surveys will be directed toward areas where prior data indicates a possible need for active resource management to protect important sites. The BLM may also acquire scientifically or historically valuable sites through land exchanges, when such a goal is determined to be in the public interest.

Paleontological Resources

Paleontological resources currently are protected by clearance or review action on a case-by-case basis. Avoidance or mitigation of specimens is occasionally called for when there are surface disturbances. Management plans will be developed for significant properties requiring protection or stabilization. Assistance to institutions doing research or collection of specimens will continue. Monitoring and recording of specimen locations will continue.

Lands

Trespass Abatement

Existing unauthorized uses of public land will be resolved either through termination, authorization by lease or permit, exchange or sale. Decisions will be based on consideration of the following criteria:

the type and significance of improvements involved;

conflicts with other resource values and uses, including potential values and uses; and

whether the unauthorized use is intentional or unintentional.

New cases of unauthorized use generally will be terminated immediately. Temporary permits may be issued to provide short-term authorization, unless the situation warrants immediate cessation of the use and restoration of the land. Highest priority will be given to abatement of the following unauthorized uses:

new unauthorized activities or uses where prompt action can minimize damage to public resources and associated costs;

cases where delay may be detrimental to authorized users;

cases involving special areas, sensitive ecosystems, and resources of national significance; and

cases involving malicious or criminal activities.

Rights-of-Way

Right-of-way applications will continue to be approved on a case-by-case basis. Most of the present rights-of-way applications are for maintenance or upgrading of existing rights-of-way. Applicants are encouraged to locate new facilities within existing rights-of-way. Current levels of right-of-way applications average 10 per year.

Leases, Permits, and Easements

Legitimate uses of public land may be authorized on a case-by-case basis by permits, leases, and easements if they cannot be authorized by other laws and regulations.

Permits may be granted for a maximum of three years for uses that require no extensive improvements, construction, or surface disturbance.

Leases may be granted to authorize use of public lands for long-term developments such as cultivation, small trade, or manufacturing concerns.

Easements may be authorized to assure that the uses of public land, by the public, can be maintained and guaranteed if the land passes to private ownership. Easements may be used to preserve cultural and historic resources and threatened or endangered animal species on public and adjacent private land if it is determined to be in the public interest.

Forestry

Forestry products such as firewood, posts, poles and timber are sold on an incidental basis. The forestry resource will continue to be managed at the present level, which is primarily for wildlife habitat, soils stabilization and watershed. Table 2-1 depicts the number of permits granted for each category of forest product use.

TABLE 2-1
FOREST PRODUCTS FOR EIGHT YEAR PERIOD

	Number of Permits	Total
Firewood	5	38 cords
Posts	2	1,500 cords
Poles	0	0
Timber	0	0
Christmas Trees	0	0
Seedlings	1	20 seedlings

PUBLIC COMMENT ON THE ALTERNATIVES

An analysis of current and potential management of coal, vegetation utilization, lands, and wilderness issues, coupled with planning and environmental regulations and public input, suggested Alternatives A, B, C and D displayed in Table 2-2. These alternatives were initially presented to other governmental agencies, advisory and interest groups, Indian tribes and the public through a brochure distributed May 3, 1983. See Appendix C.

Coal

Public attitudes on coal leasing ranged mainly from favoring the restriction of new coal leasing to adding some additional coal for lease as in Alternative A. There were a number of negative comments about opening any additional coal for lease consideration at this time (1983). Many of the respondents commented that market conditions are such that there is no demand for more coal leasing.

The array of alternatives for future management of the coal resource includes two with substantial acreages made available for further lease consideration. These would be pools from which tracts may be selected for lease at intervals during the coming years. The coal lands as contained in Alternatives B and C meet the criteria for further leasing consideration as described in Chapter 1. None of the alternatives suggest that a significant portion of the coal resource would actually be leased. Alternative C contains some 1,088,291 acres either leased or acceptable for further lease consideration. In the unlikely event coal sales of the magnitude of the 1982 Powder River coal sale were to continue at the rate of every two years, it would take approximately 224 years to lease the coal contained in the alternative.

Vegetation Allocation

Public comment most consistently supported the vegetation utilization proposal of Alternative B. Although there is support for improving wildlife habitat, the majority of responses did not support management which would reduce livestock grazing, let alone eliminate it. The respondents preferred balanced range development, with emphasis on improving range for both livestock and wildlife. Ranchers especially seemed to feel that there are minimal conflicts between livestock and wildlife, and that a healthy range is good for both. Hunters, naturalists and wilderness users were more likely to prefer the vegetative utilization proposals of Alternative D. They were more willing to accept reduced grazing for livestock as a method of improving wildlife habitat.

Lands

The majority of public comments on the lands issue ranged between a preference for Alternative A and Alternative D. There were many extra written comments on this issue with strong opposition to the selling of large tracts of federal land. The respondents favored exchange over land sales. Overall, most of the comments indicated a support for retaining most of the public land, with some latitude for sales and exchange. There seems to be support for land exchange to obtain lands with better recreation and wildlife value or to consolidate for better management. There also seems to be some support for selling small (up to 160 acres) isolated tracts, if preference in purchasing is given to the current grazing operator.

Wilderness

Public comment about wilderness ranged from no wilderness as in Alternative A or C to some wilderness as in Alternative B. Analysis of comments indicated wilderness is a polarized issue. There seems to be as much intensity in opposing new wilderness designation, if not more, as there is in support of it. Hunters, wilderness users, energy workers and naturalists generally support wilderness designation, while ranchers generally oppose it.

RATIONALE FOR SELECTING THE PREFERRED ALTERNATIVE

Each of the four alternatives considered in detail represents a comprehensive plan for managing all land and resources based on the alternate themes of continuing present management (no action), Alternative A; full multiple use consideration of all resources, Alternative B; use of one resource over others, Alternative C; and resource protection, Alternative D. Following an environmental analysis of each alternative and considering planning questions, planning criteria, and public input about the alternatives, a single management alternative then could not be selected from the four to resolve all the issues. However, a mixture of issue treatments from three of the alternatives became a reasonable choice for optimizing the management of all the issues.

The Preferred Alternative was selected to include the coal and vegetation utilization portions from Alternative B, lands from Alternative D and Wilderness from Alternative C.

Coal

The coal portion from Alternative B was preferred because it provided a wide selection of potential sites for coal leasing consideration while removing and protecting areas with substantial multiple use conflicts. This theme answers the question of which areas can be made available for further lease consideration using all criteria. Many of the environmental conflicts associated with surface mining could be mitigated by having a wide rather than narrow selection of potential sites for further lease consideration at this general planning point in the coal management program. BLM shares the concern stated in many public comments which would restrict new coal development, considering 1983 energy demands. This theme does not suggest nor prematurely restrict the possibility of new leasing for the life of the plan but allows future flexibility in meeting long term energy needs.

Vegetation Utilization

The vegetation utilization proposal from Alternative B was preferred, because it would provide for a balanced improvement of vegetation, wildlife habitat, and watershed conditions. The theme categorizes grazing allotments for improvement, maintenance, or custodial care, and does not adversely affect the rancher with proposed grazing reductions. Because about 70 percent of the rangeland is in good or better condition, this theme requires minor changes from current management. This theme answers the planning questions of vegetation utilizations among livestock, wildlife, and watershed, allotment categorization, and utilization effects on the rancher. It also makes full use of all criteria and would be acceptable based on public input.

TABLE 2-2 SUMMARY OF THE ALTERNATIVES

	PREFERRED ALTERNATIVE	ALTERNATIVE A (No Action)
ISSUE	This alternative represents a selection of portions of the other four alternatives which presents the best mix of resources management considering multiple use, the planning questions, criteria, public input, and environmental consequences.	This alternative emphasizes a continuation of present management direction and would continue the present levels or systems of resource use and respond to the requirements of new regulations and changing policies. This is the no action alternative.
COAL	Future development would come from current leases covering 39,391 acres (3.43 billion tons), those unleased areas determined acceptable for further consideration in the 1979 MFP Update and 1982 Amendment covering 91,700 acres (7.83 billion tons) and unleased areas determined acceptable for further consideration from new planning covering 862,500 acres (53.92 billion tons). The combined total is 993,591 acres (65.18 billion tons). Emergency leases would be issued to maintain production or avoid a bypass situation on a case-by-case basis. Exchanges would be considered for existing leases, by direction of legislation, for leases located in alluvial valley floors. Other exchanges would be considered on a case-by-case basis.	Future development would come from current leases covering 39,391 acres (3.43 billion tons) and those unleased areas determined acceptable for further consideration in the 1979 MFP Update and 1982 Amendment covering 91,700 acres (7.83 billion tons). The combined total is 131,091 acres (11.26 billion tons). Emergency leases would be issued to maintain production or avoid a bypass situation on a case-by-case basis. Exchanges would only be considered for existing leases, by direction of legislation, or for leases located in alluvial valley floors.
VEGETATION UTILIZATION	Vegetation utilization would be: Short Term (AUMs) / Long Term (AUMs) Livestock: 208,083 / 233,387 Wildlife, watershed and other non-consumptive uses: 624,249 / 700,161 TOTAL: 832,332 / 933,548 There would be 160,024 acres of rangeland upgraded to good condition. Potential projects would include 30 wells, 300 reservoirs and pits, 20 pipelines, 50 fences, 10 springs developed and 125,023 acres of mechanical treatments. There would be 27 AMPs and 72 potential activity plans on 215,905 acres. Woody riparian vegetation would receive special management on 5,000 acres. Wildlife facilities would be built at an average annual rate of 20 bird ramps, 20 bird nest boxes, 10 goose nesting platforms, one livestock exclosure and two reservoirs stocked with fish. An average of 40 acres of prairie dog towns and 130 acres of noxious weeds would be controlled annually. Prescribed burning would be allowed on 20 acres annually.	Vegetation utilization would be: Short Term (AUMs) / Long Term (AUMs) Livestock: 208,083 / 208,083 Wildlife, watershed and other non-consumptive uses: 624,249 / 624,249 TOTAL: 832,332 / 832,332 Potential maintenance or replacement projects would include 30 wells, 225 reservoirs and pits, 30 pipelines, 30 fences, 60 springs developed and 4,500 acres of potential mechanical treatments. There would be 27 AMPs on 148,232 acres. Woody riparian vegetation would receive special management on 5,000 acres. Wildlife facilities would be built at an average annual rate of 20 bird ramps, 20 bird nest boxes, 10 goose nesting platforms, one livestock exclosure and two reservoirs stocked with fish. An average of 40 acres of prairie dog towns and 130 acres of noxious weeds would be controlled annually. Prescribed burning would be allowed on 20 acres annually.
LANDS	A total of 165,054 acres would be categorized with potential for disposal. In the long term, 123,542 acres would be considered for exchange or jurisdictional transfer and 41,181 acres for sales. The 331 remaining acres with potential for community expansion would be disposed of on a case-by-case basis under the Recreation and Public Purpose Act.	Adjustments to the land pattern would be made on a case-by-case basis. There would be an estimated 640 acres sold, 3,840 acres exchanged and 40 acres conveyed under the Recreation and Public Purposes Act based on long-term projections.
WILDERNESS	Zook Creek and Buffalo Creek WSAs would be recommended as not suitable for wilderness designation. Future management would consider other resources.	No suitability recommendation would be made for Zook Creek and Buffalo Creek WSAs. Present management of the two areas would continue.

ALTERNATIVE B (Multiple Use)	ALTERNATIVE C (Resource Production)	ALTERNATIVE D (Resource Protection)
This alternative emphasizes the management and production of resources with full consideration for multiple use values. Multiple use management would be directed toward providing a flow of renewable and nonrenewable resources from the public lands considering conflict with and mitigation measures for other resources.	This alternative emphasizes a dominant singular resource use instead of the full spectrum of multiple uses. This management would be directed towards providing a significant increase in the use of a few resources with a corresponding reduction in the multiple use balance.	This alternative emphasizes a reduction in the use of resources and stresses the protection and enhancement of the natural environment.
Future development would come from current leases covering 39,391 acres (3.43 billion tons), those unleased areas determined acceptable for further consideration in the 1979 MFP Update and 1982 Amendment covering 91,700 acres (7.83 billion tons) and unleased areas determined acceptable for further consideration from new planning covering 882,500 acres (53.92 billion tons). The combined total is 993,591 acres (65.18 billion tons). Emergency leases would be issued to maintain production or avoid a bypass situation on a case-by-case basis. Exchanges would be considered for existing leases, by direction of legislation, for leases located in alluvial valley floors, and on a case-by-case basis.	Future development would come from current leases covering 39,391 acres (3.43 billion tons), those unleased areas determined acceptable for further consideration in the 1979 MFP Update and 1982 Amendment covering 91,700 acres (7.83 billion tons) and unleased areas determined acceptable for further consideration from new planning covering 957,200 acres (58.55 billion tons). The combined total is 1,088,291 acres (69.81 billion tons). Emergency leases would be issued to maintain production or avoid a bypass situation on a case-by-case basis. Exchanges would be considered for existing leases, by direction of legislation, for leases located in alluvial valley floors, and on a case-by-case basis.	Future development would be restricted to current leases covering 39,391 acres (3.43 billion tons). Emergency leases would be issued to maintain production or avoid a bypass situation on a case-by-case basis. Exchanges would only be considered for existing leases, by direction of legislation, or for leases located in alluvial valley floors.
Vegetation utilization would be: Short Term (AUMs) / Long Term (AUMs) Livestock: 208,083 / 233,387 Wildlife, watershed and other non-consumptive uses: 624,249 / 700,161 TOTAL: 832,332 / 933,548 There would be 160,024 acres of rangeland upgraded to good condition. Potential projects would include 30 wells, 300 reservoirs and pits, 20 pipelines, 50 fences, 10 springs developed and 125,023 acres of potential mechanical treatments. There would be 27 AMPs and 72 potential activity plans on 215,905 acres. Woody riparian vegetation would receive special management on 5,000 acres. Wildlife facilities would be built at an average annual rate of 20 bird ramps, 20 bird nest boxes, 10 goose nesting platforms, one livestock exclosure and two reservoirs stocked with fish. An average of 40 acres of prairie dog towns and 130 acres of noxious weeds would be controlled annually. Prescribed burning would be allowed on 20 acres annually.	Vegetation utilization would be: Short Term (AUMs) / Long Term (AUMs) Livestock: 208,083 / 319,269 Wildlife, watershed and other non-consumptive uses: 624,249 / 957,798 TOTAL: 832,332 / 1,277,067 There would be 876,614 acres of rangeland upgraded to excellent condition. Potential projects would include 75 wells, 700 reservoirs and pits, 60 pipelines, 150 fences, 50 springs developed and 518,549 acres of potential mechanical treatments. There would be 27 AMPs and 246 potential activity plans on 781,388 acres. Woody riparian vegetation would receive special management on 5,000 acres. Wildlife facilities would be built at an average annual rate of 20 bird ramps, 20 bird nest boxes, 10 goose nesting platforms, one livestock exclosure and two reservoirs stocked with fish. An average of 40 acres of prairie dog towns and 130 acres of noxious weeds would be controlled annually. Prescribed burning would be allowed on 20 acres annually.	Vegetation utilization would be: Short Term (AUMs) / Long Term (AUMs) Livestock: 177,491 / 232,608 Wildlife, watershed and other non-consumptive uses: 654,841 / 701,727 TOTAL: 832,332 / 934,335 There would be 314,469 acres of rangeland upgraded to good condition. Potential projects would include 30 wells, 300 reservoirs and pits, 20 pipelines, 50 fences, 10 springs developed and 125,023 acres of potential mechanical treatments. There would be 21 water sources identified as having wildlife values and fenced. There would be 27 AMPs and 72 potential activity plans on 215,905 acres. Woody riparian vegetation would receive special management on 5,000 acres. Wildlife facilities would be built at an average annual rate of 20 bird ramps, 20 bird nests boxes, 10 goose nesting platforms, one livestock exclosure and two reservoirs stocked with fish. An average of 40 acres of prairie dog towns and 130 acres of noxious weeds would be controlled annually. Prescribed burning would be allowed on 20 acres annually.
A total of 165,054 acres would be categorized with potential for disposal. In the long term, 82,362 acres would be considered for sales and 82,361 acres for exchanges or jurisdictional transfer. The 331 remaining acres with potential for community expansion would be disposed of on a case-by-case basis under the Recreation and Public Purpose Act.	A total of 165,054 acres would be categorized with potential for disposal. In the long term, 123,542 acres would be considered for sales and 41,181 acres for exchanges or jurisdictional transfer. The 331 remaining acres having potential for community expansion would be disposed of on a case-by-case basis under the Recreation and Public Purposes Act.	A total of 165,054 acres would be categorized with potential for disposal. In the long term, 123,542 acres would be considered for exchange or jurisdictional transfer and 41,181 acres for sales. The 331 remaining acres with potential for community expansion would be disposed of on a case-by-case basis under the Recreation and Public Purpose Act.
Zook Creek WSA would be recommended as suitable for wilderness and Buffalo Creek WSA would be recommended as not suitable for wilderness. Zook Creek would be managed as wilderness but some current commitments would have to be honored. Future management of Buffalo Creek would consider other resources.	Zook Creek and Buffalo Creek WSAs would be recommended as not suitable for wilderness designation. Future management would consider other resources.	Zook Creek and Buffalo Creek WSAs would be recommended as suitable for wilderness designation. Both areas would be managed as wilderness but some current commitments would have to be honored.

Lands

The lands portion from Alternative D was preferred, because it best addresses the planning questions of repositioning of public lands, gaining public access, and seeking to acquire lands with high public values and lands bordering large bodies of water. Through this theme improved land ownership patterns would be achieved using exchange as the preferred method of land transaction, with a de-emphasis on sales. Exchanges are preferred by the BLM and the public. Public land would largely remain under federal ownership, which was a common public concern. Transactions would only be made after considering all criteria in this theme and would cause the fewest adverse impacts and the most beneficial impacts.

Wilderness

After assessing their wilderness qualities and potential, neither Zook Creek nor Buffalo Creek was considered suitable for wilderness designation. Zook Creek possesses low wilderness values and Buffalo Creek possesses minimum wilderness values compared with other wilderness study areas. Wilderness manageability problems could arise from existing oil and gas leases at Zook Creek and at both areas from indirect conflicts from coal development.

The wilderness portion from Alternative C was preferred because it allowed changes for future multiple use management. Both wilderness portions of Alternative A and Alternative C would propose no wilderness, but Alternative A would restrict resource management to the continuation of existing management.

The preferred theme addresses the planning question of wilderness suitability designation and considers all criteria. Public opinion, in general, was split on the wilderness issue, but most comment provided for no wilderness.

Coal

Coal leased or acceptable for further lease consideration would include the 39,391 leased acres containing 3.43 billion tons (Table 2-3) and the 91,700 unleased acres containing 7.83 billion tons cleared in previous planning (Table 2-4). An additional 862,500 acres and 53.92 billion tons of unleased coal in new planning would be available for further consideration for leasing, allowing continuation and expansion of the coal industry. Combined leased and unleased areas total 993,591 acres and contain 65.18 billion tons of coal. These areas are shown on the Preferred Alternative map in the map packet. Emergency leases would continue to be issued to maintain current production or avoid bypass situations on a case-by-case basis.

TABLE 2-3
CURRENT FEDERAL COAL LEASES

County	(Mine or tract name)	Acres	Tons (billion)
Big Horn	(Decker, Spring Creek, Wolf Mountain, CX Ranch, Shell-Pearl)	18,954	2.63
Rosebud	(Colstrip, Big Sky, Coal Creek)	16,468	0.54
Treasure	(Colstrip)	920	0.02
Custer		0	0.00
Powder River	(Cook Mountain, Coal Creek)	3,049	0.24
Total		39,391	3.43

TABLE 2-4
COAL ACCEPTABLE FOR FURTHER LEASE CONSIDERATION FROM PREVIOUS PLANNING (1979 MFP UPDATE AND 1982 AMENDMENT)

County	(Mine or Tract Name)	Acres	Tons (billion)
Big Horn	(Decker, Squirrel Creek, Hanging Woman)	38,100	3.95
Rosebud	(Colstrip, Greenleaf-Miller)	15,500	0.62
Treasure	(Colstrip)	300	0.01
Custer		0	0.00
Powder River	(Moorhead, Otter Creek Ashland, [Decker-Birney])	37,800	3.25
Total		91,700	7.83

Coal exchanges would be considered for existing leases, by direction of legislation, or for leases located in alluvial valley floors. Exchanges would also be considered on a case-by-case basis, using three major criteria: equal value; consolidation of federal mineral ownership; and serving the public interest.

All tonnages are based on in-place coal with development potential defined as beds five feet thick or greater with a 15:1 stripping ratio or less and 500 feet of overburden or less. This gives a greater tonnage than actual limits currently used by the mining industry in the area, where stripping limits seldom exceed 200 feet of overburden or a ratio of 6:1. Tonnage calculations are based on 1,770 tons per acre foot.

Short term is defined as 10 years or less. Long term is considered from 10 to 40 years.

Under existing laws and regulations, mined lands would be reclaimed. The main objective of reclamation is to restore the disturbed lands to a permanent, diverse vegetative cover of predominantly (at least 51%) native plant species suitable for livestock grazing and wildlife habitat. Measures such as replacement of stockpiled topsoil, hydromulching, and seeding would be used to encourage reclamation. Drainages would be reconstructed and the approximate original contour of the surface would be reestablished to minimize erosion and maximize benefits from precipitation. Reclamation plans and reclamation bonds would be required for each coal mine. Requirements are detailed in the Strip and Underground Mine Reclamation Rules and Regulations for the State of Montana and are enforced by the Montana Department of State Lands (DSL), under authority of the U.S. Office of Surface Mining Reclamation and Enforcement (OSM).

Threatened and endangered species, other species of special concern to both state and federal agencies, and the habitats of these species would be protected from significant impacts by the application of unsuitability criteria. The application of unsuitability criteria stipulations may dictate site specific mitigation measures.

Mine related activities would be required by state and federal regulations to protect the quantity and quality of surface and ground water outside the mine area. Monitoring by the mining companies would be required to assure compliance.

Degradation of air quality in Class I (Northern Cheyenne Indian Reservation) and Class II (the entire Resource Area) areas would be limited to acceptable levels as outlined in federal and state ambient air quality standards.

Federal laws dealing with cultural resources would be followed during any mining. Under federal laws (36 CFR 60.6 and 800, and 43 CFR 3461). Significant sites, those determined eligible to the National Register of

Historic Places, must be considered prior to approval of a mine plan. Determinations of eligibility to the Register are made in consultation with the Advisory Council on Historic Preservation and the State Historic Preservation Officer. Protective measures for National Register eligible sites can include avoidance, mitigation through data retrieval, and preservation.

When public surface is included within a tract for possible coal leasing, as well as within existing leases, no additional range improvements would be proposed.

With future oil and gas development in unleased coal areas, the policy is to plan for multiple oil/gas and coal development, if stipulations can protect oil and gas production. However, if significant oil/gas production would be lost due to coal mining, coal leasing should be deferred until the conflict no longer exists. In current coal leases, coal mining would have preference over new oil and gas leases and production.

Where conflicts between sand, gravel, and clinker and coal use occur, coal use would have priority.

Any ground disturbing activities would address the preservation of significant paleontological resources, in accordance with the Antiquities Act of 1906. Mitigation would consist of avoiding or removing the paleontological resources on a case-by-case basis.

The BLM applies four screens to determine coal areas acceptable for further consideration for leasing. These screens are designed to identify coal deposits and to limit the coal found acceptable for further consideration to those areas with the best coal potential and where no overriding resource or environmental conflicts exist. Application of the screens in this plan involves only new areas of federal coal not screened in previous plans. The four screens are: (1) identification of coal-bearing areas with development potential; (2) application of surface owner consultation; (3) application of unsuitability criteria; and, (4) analysis of multiple use conflicts.

Identification of Coal with Development Potential

A total of 1.74 million acres (exlcuding National Forest and Indian Lands) contain coal with development potential amounting to 100.27 billion tons. Of this figure, 0.48 million acres and 20.61 billion tons are state and private coal, 0.13 million acres and 11.26 billion tons are federal coal either leased or in previous planning, and 1.13 million acres and 68.40 billion tons are federal coal in new planning. Table 2-5 identifies the acres and tons of federal coal with development potential.

Surface Owner Consultation

The surface owner consultation process, as defined in the 1977 Surface Mining Control and Reclamation Act, provides qualified private surface owners over federal coal the opportunity to have their views for or against coal leasing considered in land use planning. Split estate occurs on 84% of the federal coal. As a result of surface owner consultation, 104,421 acres of private surface containing 4.91 billion tons of coal with development potential were deleted from further consideration. By county, the acres and tonnages deleted are as shown in Table 2-6.

TABLE 2-5
IDENTIFICATION OF FEDERAL COAL WITH DEVELOPMENT POTENTIAL

County	Total Acres	Total Tons (billions)	Public Domain Acres	Split Estate Acres
Big Horn	296,500	28.70	23,000	273,500
Rosebud	207,300	11.30	37,100	170,200
Treasure	4,000	0.10	0	4,000
Custer	56,300	1.30	7,800	48,500
Powder River	561,500	27.00	115,100	446.400
Total	1,125,600	68.40	183,000	942,600

Source: BLM Resource Evaluation

TABLE 2-6
ACRES AND TONS DELETED DUE TO NEGATIVE SURFACE OWNER VIEWS

County	Acres	Tons (billion)
Big Horn	28,974	2.86
Rosebud	35,263	0.56
Treasure	1,240	0.04
Custer	5,160	0.08
Powder River	33,784	1.37
Total	104,421	4.91

Significant negative views satisfied one or more of the following five criteria: (1) they covered several sections in a solid pattern; (2) they included checkerboard federal coal ownership in a pattern to preclude mine development; (3) they were in addition to views expressed by the same owner in previous coal planning; (4) they covered a significant area adjacent to Custer National Forest; or, (5) they overlapped with or were adjacent to large areas deleted due to unsuitability criteria.

Some areas of federal coal without negative views were deleted where surrounded by or sandwiched between negative views, in a pattern which would probably prevent logical mining. In other cases, negative surface owner views covering only a small, isolated area were not deleted.

Unsuitability Criteria

Sections 522 and 523 of the Surface Mining Control and Reclamation Act provide for designating areas unsuitable for surface coal mining if certain conditions exist. The Secretary of Interior's decisions and BLM's rulemaking of July 19, 1979, established twenty unsuitability criteria. Some of these criteria are based on federal or state laws dealing with threatened or endangered plant or animal species, water, historic sites, and specially designated federal lands such as wilderness study areas, national parks and monuments. Other criteria are based on Presidential Orders dealing with items such as floodplains and wetlands. There are also criteria to protect alluvial valleys, rights-of-way, occupied dwellings, and designated special use areas.

As a result of the unsuitability criteria, 64,081 acres containing 4.94 billion tons of federal coal with development potential were deleted from further leasing consideration (Table 2-7). An additional 38,411 acres were identified where exceptions to some criteria have been or may be applied, where mitigating measures may protect values and still allow mining (Table 2-8). Stream miles with preliminarily identified alluvial valley floors are summarized by county in Table 2-9.

TABLE 2-7
ACRES AND TONS (MMT) DELETED FROM FURTHER LEASE CONSIDERATION DUE TO UNSUITABILITY CRITERIA (UNSUITABLE WITHOUT EXCEPTIONS) [1]

		Big Horn Co.		Rosebud Co.		Powder River Co.		Custer Co.		Treasure Co.		Total	
Criterion Number	Criterion	Acres	Tons (MMT)	Acres	Tons (MMT)	Acres	Tons (MMT)	Acres	Tons (MMT)	Acres	Tons (MMT)	Acres	Tons (MMT)
1	Federal Land Systems	0	0	0	0	332	44	0	0	0	0	332	44
3	Cemeteries, Schools and Parks	21	2	0	0	15	6	76	2	0	0	112	10
4, 5	Wilderness/Scenic Federal Lands	0	0	8,438	464	5,933	70	0	0	0	0	14,371	534
7	Cultural Resources	5,051	654	0	0	1,404	23	0	0	0	0	6,455	677
11	Eagle Nest Sites	3,625	387	800	55	2,015	132	400	13	0	0	6,840	587
12	Eagle Concentration Areas	673	97	1,347	132	0	0	0	0	0	0	2,020	229
13	Falcon Nest Sites	1,918	205	2,029	130	593	79	0	0	0	0	4,540	414
15	State Resident Fish and Wildlife	22,158	2,370	12,428	933	960	43	998	18	0	0	36,544	3,364
16	Floodplains	1,832	91	1,383	45	2,966	0[4]	0	0	0	0	6,181	136
Overlaps[2]		5,959	599	5,493	318	1,862	137	0	0	0	0	13,314	1,054
Total Unsuitable Areas[3]		29,319	3,207	20,932	1,441	12,356	260	1,474	33	0	0	64,081	4,941

[1] Other areas are unsuitable where an exception can be applied under Criteria 2, 3, 7 and 15. See Table 2-8 for summary of these additional areas.
Preliminary alluvial valley floor determination under Criterion 19 identified certain stretches of streams as shown in Table 2-9. Final determination will be made at the activity planning stage.
No lands were found unsuitable under Criteria 6, 8, 9, 10, 14, 17, 18 and 20.

[2] Overlap totals include overlaps between different unsuitability criteria as well as overlaps between criteria and areas deleted due to negative surface owner views.

[3] Excludes areas overlapping with areas deleted due to negative surface owner views.

[4] Although 2,966 acres were designated as floodplains, only the portions of legal subdivisions outside the floodplain contain insignificant quantities of coal with development potential.

MMT = Million Tons

TABLE 2-8
ACRES IDENTIFIED UNDER UNSUITABILITY CRITERIA WHERE AN EXCEPTION HAS BEEN OR MAY BE APPLIED

Criterion Number	Criterion	Big Horn County	Rosebud County	Powder River County	Custer County	Treasure County	All Counties
2	Rights-of-Way (federal surface)	59	7	165	26	0	257
3	Rights-of-Way	3,984	2,267	6,094	524	18	12,887
	Buffer Zones (private surface)	396	195	800	98	0	1,489
7	Cultural Resources	0	4,062	2,159	555	0	6,776
15	State Resident Fish and Wildlife	10,070	5,522	8,048	2,948	498	27,086
	Overlaps*	5,459	2,566	1,514	367	178	10,084
	Total Area Unsuitable With Exceptions	9,050	9,487	15,752	3,784	338	38,411

*Includes overlap between areas unsuitable with exception and areas unsuitable with or without exception as well as areas deleted due to negative surface owner views.

TABLE 2-9
PRELIMINARILY ALLUVIAL VALLEY FLOORS IDENTIFIED

County	Stream Miles*
Big Horn	197.6
Rosebud	174.0
Treasure	7.2
Custer	33.6
Powder River	443.8
Total	856.2

* Includes areas underlain by private as well as federal coal with development potential.

Multiple Use Analysis

During the multiple use analysis, resource values or concerns not covered by the unsuitability criteria are addressed. These values may be on-site resources such as soils, agriculture, wildlife and watershed, or they may address regionwide issues such as social and economic values. As a result of multiple use conflicts, 94,700 acres containing 4.63 billion tons of federal coal were deleted from further leasing consideration. These deleted areas had passed through the unsuitability and surface owner screens. Table 2-10 summarizes results of this analysis.

TABLE 2-10
APPLICATION OF MULTIPLE USE ANALYSIS

County	Coal Acceptable Excluding Multiple Use Conflicts		Coal Deleted Due To Multiple Use Conflicts		Coal Remaining After Multiple Use Analysis	
	Acres	Tons (billions)	Acres	Tons (billions)	Acres	Tons (billions)
Big Horn	238,200	22.63	6,200	0.84	232,000	21.79
Rosebud	151,100	9.30	36,700	2.25	114,400	7.05
Treasure	2,800	0.06	0	0	2,800	0.06
Custer	49,700	1.19	6,600	0.22	43,100	0.97
Powder River	515,400	25.37	45,200	1.32	470,200	24.05
Total	957,200	58.55	94,700	4.63	862,500	53.92

A total of 342,600 acres containing 24.97 billion tons of federal coal have been found acceptable for further lease consideration (with adequate inventory to fully apply the unsuitability criteria). An additional 519,900 acres containing 28.95 billion tons of federal coal have been found acceptable pending further study. In these areas, wildlife inventories were incomplete and the wildlife related criteria (#9-15) were not applied; however, the nonwildlife criteria were applied. Wildlife inventories need to be completed and unsuitable areas deleted before these areas can be cleared (Table 2-11). For a more detailed description of the application of the unsuitability, surface owner, and multiple use screens, see Appendix D.

TABLE 2-11
FEDERAL COAL ACCEPTABLE FOR FURTHER CONSIDERATION IN PREFERRED ALTERNATIVE AND ALTERNATIVE B

	Coal Acceptable for Further Consideration With Adequate Inventory		Coal Acceptable For Further Consideration Pending Further Study		Total Coal Acceptable For Further Consideration	
County	Acres	Tons (billion)	Acres	Tons (billion)	Acres	Tons (billion)
Big Horn	90,900	9.29	141,100	12.50	232,000	21.79
Rosebud	53,400	3.55	61,000	3.50	114,400	7.05
Treasure	2,400	0.05	400	0.01	2,800	0.06
Custer	17,300	0.57	25,800	0.40	43,100	0.97
Powder River	178,600	11.51	291,600	12.54	470,200	24.05
Total	342,600	24.97	519,900	28.95	862,500	53.92

Vegetation Utilization

In the short term (five years), vegetation utilization for livestock would be 208,083 AUMs with wildlife, watershed protection and other nonconsumptive uses receiving 624,249 AUMs for a total of 832,332. In the long term (over 15 years), vegetation utilization for livestock would be 233,387 AUMs (a 25,304 AUM increase) with wildlife, watershed protection and other nonconsumptive uses receiving 700,161 AUMs (a 75,912 AUM increase) for a total of 933,548. Livestock use by individual allotment is shown in Appendix E.

Based on new range improvements, expected AUM increase and proper grazing management, allotment adjustments would be considered following a monitoring period of up to five years and the cooperation of the operator. Insignificant livestock adjustments would be allowed using a shorter monitoring period.

This alternative calls for upgrading 160,024 acres of selected public rangeland to good condition by using more intensive grazing management and range improvements. The lands to be upgraded are shown on the Preferred Alternative map in the map pocket. A transparent overlay showing allotment boundaries can be used to find specific allotments when placed over the alternative map. A total of 125,023 of the acreage to be upgraded would have potential for mechanical treatments.

The 27 existing AMPs would be continued with up to 72 potential activity plans implemented on 215,905 acres. The 72 were selected by considering acreage, range condition, potential for improvement, public land percentage, watershed and wildlife habitat.

Mechanical treatments would be used where grazing systems may not help on 125,023 acres. Mechanical treatments could include scalping, chiseling, contour furrowing, pitting, ripping, interseeding and chaining. Other land treatments could include herbicides and fire. Range improvements over a 15-year period would include about 50 management fences, averaging two miles in length, needed to implement grazing systems. There would also be 30 wells, 300 reservoirs or pits, 20 pipelines (five miles/pipeline) and 10 springs developed. Approximately 21 of the proposed water sources identified as having wildlife values would be fenced to prevent livestock use except at the water gaps.

Estimated cost of range improvements would be $6,465,960, based on the current average cost per improvement (Appendix F).

The present rangeland condition (vegetation and soil) of the range sites in each allotment has been analyzed in relation to the production potential of those range sites, using the SCS Tech Guides for Range Site Criteria as the guideline. Vegetation use has been estimated on the basis of proper use in the current range condition. Management proposals are based on the adequacy of present management and the need for change to improve rangeland condition and develop range site potential.

Vegetation use adjustments would be based on site specific monitoring studies which determine proper use as reflected by trend in plant species composition and soil erosion condition.

Soil, water and air resources would continue to be evaluated as a part of project level planning. Such evaluations consider the significance of a proposed project and the sensitivity of soil, water and air resources. Stipulations would be attached as needed to protect adjacent resources. Soils would be managed to maintain productivity and minimize erosion. Areas with accelerated erosion problems would be managed to improve watershed conditions. Water quality would be monitored and maintained or improved within state and federal standards.

During the summers of 1979-1981, all public lands were surveyed for range condition and put into four condition classes, based upon the range sites. Results of the survey are shown in Table 2-12.

Following the condition classification, each allotment was categorized for: improved(I), maintained (M), or custodial (C) management. See Table 2-13.

The process for categorization of the allotments was: (1) The amount of public land in the allotment. If public land is less than 320 acres, the allotment was put in a "C" category if remaining criteria did not conflict. Allotments with more than 320 acres were subjected to the next criterion. (2) Allotments with less than 20% public land were placed in the "C" category if remaining criteria did not conflict. On allotments with more than 20%, Criterion three was applied. (3) Allotments with more than 60% in good or better range condition were put in the "M" category. If the allotment had less than 60% in good or better condition, it was placed into the "I" category. (4) All "I" allotments were then rated on the amount of public land and the percentage of public land in the ranch. (This rating considered the potential for increased vegetative production, based on the land capability classes.) (5) Area personnel reviewed all "I" and "M" category allotments, which resulted in category changes of several allotments. (6) All existing AMPs were placed into the "I" category. This was done to ensure that all existing AMPs are fully operational. As appropriate, existing AMPs will be changed to "M" category allotments. Categorization resulted in 174 "M" allotments, 99 "I" allotments and 369 "C" allotments. The acreage for each category is shown in Table 2-13. All "I" allotments would be upgraded to good condition. "M" allotments would either be maintained in good condition or upgraded. "C" allotments would continue under custodial management. Operators would be encouraged to contribute to range improvement projects on public land. Range improvements on the M and C allotments would be handled on a case-by-case basis.

TABLE 2-12
RANGE CONDITION CLASS OF PUBLIC LANDS

Condition	Acres	Percent
Excellent	32,867	3.0
Good	709,463	65.7
Fair	308,656	28.6
Poor	3,686	0.3
Unsuitable (for livestock)	9,895	0.9
Other (waterspreaders, dikes, etc.)	16,108	1.5
Total	1,080,675	100.0

TABLE 2-13
OVERALL RANGE CONDITION (ACRES) TOTAL ACRES AND TOTAL AUMS BY M.C.I. ALLOTMENTS

Management Area	Excellent	Good	Fair	Poor	Unsuitable	Tame Pasture	Contour Furrowing	Water-Spreaders	Ag. Lands	Abandon Cropland	*ARS Area
Maintain (M)	24,254 (74%)	431,858 (61%)	102,804 (33%)	753 (20%)	2,750 (28%)	79 (45%)	394 (6%)	2,486 (28%)	105 (20%)	—	—
Improve (I)	4,712 (14%)	181,175 (25%)	157,747 (51%)	2,277 (62%)	5,767 (58%)	87 (50%)	6,037 (94%)	5,951 (67%)	323 (61%)	—	61 (100%)
Custodial (C)	3,901 (12%)	96,430 (14%)	48,105 (16%)	656 (18%)	1,378 (14%)	8 (5%)	5 **(T)	435 (5%)	98 (19%)	39 (100%)	—
TOTALS ACRES	32,867 (100%)	709,463 (100%)	308,656 (100%)	3,686 (100%)	9,895 (100%)	174 (100%)	6,436 (100%)	8,872 (100%)	526 (100%)	39 (100%)	61 (100%)

* ARS - Agricultural Research Service Study Plots
**T - Trace

Management Area	Acres	Percent	AUMS	Percent
M	565,483	52	112,825	54
I	364,137	34	66,031	32
C	151,055	14	29,227	14
Total	1,080,675	100	208,083	100

The 27 existing AMPs include 148,232 acres of public land. Of these, 12 are functionally completed. The 12 AMPs on 59,698 acres (40%) would continue as summarized in Table 2-14. The 15 nonfunctional AMPs on 88,534 acres would be fully implemented through revisions, additional developments and monitoring to become functional AMPs.

Various grazing systems would be applied. These systems include rest and deferred rotation, deferred or seasonal use, short duration grazing, or other methods. Season and number allotments would generally have deferred or seasonal use systems. Custodial allotments would have seasonal use coordinated with the use of private land, where the public lands are a very small part of the ranch or the management goals could be met with this system.

The management of wildlife habitat would continue at the current level. This consists of monitoring the condition of sites known to be of high value to wildlife and protecting valuable wildlife habitat in the development and implementation of activity plans. Wildlife facilities would be built at the current level. Average annual improvements consist of installing 20 bird ramps, 20 bird nest boxes and 10 goose nesting platforms, constructing one livestock exclosure and stocking two reservoirs with fish.

Approximately 5,000 acres with potential to support woody riparian vegetation would receive special management consideration to promote substantial reproduction to assure that mature woody riparian areas approach good to better condition.

Maintaining woody reproduction in riparian areas to provide 30% of the woody species as saplings or younger trees would assure continued age class diversity in the system. This would assure the availability of browse for use by wildlife through winter months. The location of salt, oilers and other developments would be restricted in identified riparian zones.

Prairie dog towns on public land would continue to be inventoried and examined for presence of associated wildlife species, including threatened or endangered species. Cooperative studies with other agencies, universities and private groups to accomplish inventories and ecological studies would continue. The prairie dog ecosystem is recognized as an integral part of the prairie environment, and its perpetuation would be consistent with multiple use management of public lands. About 2,600 acres or 65 prairie dog towns are known; others undoubtedly exist. They are all managed primarily for wildlife and recreational values. Where prairie dogs are known to damage public and adjoining private rangelands, controls would be carried out on an average of 40 acres per year. Sites are first examined for presence of species of concern or threatened or endangered species.

An annual average of 130 acres of noxious weeds such as leafy spurge, Canada thistle, cocklebur and knapweed would be controlled on a case-by-case basis. Biological control would be considered if proven effective. Special precautions would be taken with the use of approved pesticides around water sources and crucial wildlife habitat.

All fire suppression activities would take place at current levels. This involves aggressive action on an average of 14 fires, amounting to 500 acres annually. Fires could be allowed to burn if described by an approved prescribed burn plan or modified suppression plan, on a case-by-case basis. This prescribed burning would average 20 acres annually.

TABLE 2-14
EXISTING ALLOTMENT MANAGEMENT PLANS

Grazing Record Number	Grazing System	Year Implemented	Trend
3478	4 Pasture RR	1975	U
3925	3 Pasture RR	1970	S
	4 Pasture RR	1970	S
3499	4 Pasture RR	1968	S
	2 Pasture DR	1968	S
3922	2 Pasture DR	1969	S
3710	2 Pasture DR	1974	S
3718	2 Pasture DR	1968	U
3732	3 Pasture DR	1971	U
3736	1 Pasture DR	1971	S
3759	5 Pasture RR	1967	U
3768	2 Pasture DR	1974	S
	3 Pasture DR	1974	S
3839	4 Pasture RR	1968	U
3841	2 Pasture DR	1968	S
3846	3 Pasture DR	1975	U
3867	3 Pasture DR	1975	U
3879	3 Pasture RR	1974	S
3894	1 Pasture RR	1968	S
3919	2 Pasture DR	1974	S
3905	2 Pasture DR	1974	U
3919,3921 3928,3929	5 Pasture RR	1968	U
3915	2 Pasture DR	1975	S
3920	3 Pasture RR	1970	U
3803	9 Pasture DR	1969	S
3951	1 Pasture DR	1971	S
3647	4 Pasture DR	1974	S
3910	2 Pasture DR	1975	U
3923	2 Pasture DR	1970	S
3927	2 Pasture DR	1969	S

RR - Rest Rotation
DR - Deferred Rotation
U - Upward
S - Static

Prior to the approval of all proposed range improvement projects, an interdisciplinary inspection would be done to evaluate the feasibility and impacts of the proposed developments. Recommendations and mitigations are discussed in the field to overcome problems that may exist and these considerations are then taken into account before final approval of the project is given.

Mitigating measures for resource protection on project developments may include:

Soils—Soil specialists identify various chemical and physical properties of the soils in relation to the type of project being proposed. If these soil properties are not adequate, it would be recommended that the project be moved to a favorable site.

Cultural—Cultural specialists conduct ground inventories to determine if any sites are present which might be eligible for the National Register of Historic Places; when such sites are located, mitigation measures can include avoidance, data retrieval and recordation or preservation.

As part of the design and construction of range improvements, federal regulations (36 CFR 800) require consideration of the effects of a federal undertaking on sites eligible to the National Register of Historic Places. Determinations of eligibility to the Register and evaluations of effect are made in consultation with the Advisory Council on Historic Preservation and the State Historic Preservation Officer. Protective measures for register eligible sites can include avoidance, mitigation through data retrieval, and preservation.

Range—Range specialists identify the proper location for the project and analyze the vegetative and livestock impacts.

Hydrology—Impacts to prior water rights would be addressed before project approval. If downstream water rights or water quality would be affected, alternate sites would be selected.

Wildlife—Wildlife specialists identify the presence of threatened and endangered species, and the location of important wildlife habitat areas in relation to the proposed project site. They consider the time of year of construction in relation to the type of wildlife in the area. Adjustments would be made considering wildlife values.

Lands

A total of 165,054 acres of public land would be categorized as having potential for disposal as shown on the Preferred Alternative map in the map pocket. Exchange and exchange pooling would be emphasized on 75% of these lands, with some jurisdictional transfers to other federal agencies considered on a case-by-case basis. Disposal by sale would be de-emphasized and considered only on 25% of these lands.

In addition to these lands, BLM would consider proposals from the public and react to other land adjustment proposals. All land actions would be in accordance with federal and state laws and regulations. Bureau and Departmental policy would be followed in all land transactions.

The lands are categorized into three divisions: retention, disposal, and further study. This categorization of lands would be used as a guideline, but flexibility would be retained to allow a case-by-case appraisal of any land or mineral transaction. Categorization is shown in Table 2-15.

TABLE 2-15
LAND CATEGORIZATION (ACRES)

County	Category		
	RETAIN	DISPOSE	FURTHER STUDY
Big Horn	27,017	0	0
Carter	470,369	38,070	2,720
Custer	134,078	52,880	0
Powder River	232,043	29,480	0
Rosebud	49,221	32,870	40
Treasure	133	11,754	0
Totals (1,080,675)	912,861	165,054	2,760

Criteria for categorization are contained in Appendix G. For analysis purposes lands actions on 47,158 acres can be expected in the short term (two years) and 165,054 acres in the long term (seven years), with 51,064 acres (31%) having potential for a change of use, based on the average of Class III and IV lands. Potential land actions are shown in Table 2-16.

Land exchanges can be consummated by two parties to consolidate private or federal inholdings or by exchange pooling involving three or more parties. Exchange pooling can result in the exchange of several isolated tracts of public land for more desirable areas, resulting in increased management efficiency and economic return to the public in the short and long term.

Lands exchanged must be equal in value or the values equalized by monies, by either party not to exceed 25% of the appraised value.

The types of land to be selected through exchange would be:

TABLE 2-16
SHORT- AND LONG-TERM LANDS ACTIONS IN THE PREFERRED ALTERNATIVE

	Short Term (2 Years)			Long Term (7 years)		
Land Action	Total Acres	(%)	Change of Use Acres	Total Acres	(%)	Change of Use Acres
Sales	11,789	25%	3,655	41,181	25%	12,766
Exchanges, exchange pooling and jurisdictional transfers	35,369	75%	10,964	123,542	75%	38,298
Total	47,158		14,619	164,723*		51,064

*The 331 acres which have potential for conveyance under the Recreation and Public Purposes Act are not included and are discussed in Table 2-17.

(1) Lands of cultural, historical, geological or paleontological values;

(2) Lands adjoining or surrounded by large tracts of public lands;

(3) Lands which provide access to bodies of water or large tracts of public land;

(4) Lands which through consolidation would increase management efficiency;

(5) Lands which would improve other resource or recreation needs;

(6) Lands which would consolidate the mineral estate.

Sales of public land would be made to qualified applicants in accordance with Section 203 of FLPMA at not less than the appraised fair market value. Such land must meet the following disposal criteria:

(1) Such tract, because of its location or other characteristics, is difficult and uneconomical to manage as part of the public lands, and is not suitable for management by another federal department or agency; or

(2) Such tract was acquired for a specific purpose and the tract is no longer required for that or any other federal purpose; or

(3) Disposal of such tract will serve important public objectives, including but not limited to, expansion of communities and economic development, which cannot be achieved prudently or feasibly on land other than public land and which outweigh other public objectives and values, including, but not limited to, recreation and scenic values, which would be served by maintaining such tract in federal ownership.

In addition, State Director guidance requires that disposal of such surface tract would not unnecessarily interfere with development of the underlying federal mineral resource.

Jurisdictional transfers of federal lands to or from other federal departments or agencies may occur when:

(1) The transfer would result in increased management efficiency and is no longer needed by that department or agency;

(2) The transfer would result in decreased administrative costs to the federal government;

(3) The transfer would serve the public or national interest.

Land actions would be used as an upgrading program to improve the land ownership pattern and provide significant public benefits.

Approximately 331 acres have been identified, due to close proximity to communities, as having potential for conveyance under the Recreation and Public Purposes Act for community expansion. See Table 2-17. Conveyances under the R&PP Act would be made to qualified applicants (state, county, local governments and nonprofit organizations) on a case-by-case basis. These conveyances usually result in a more beneficial public use such as wildlife reserves, schools and colleges, parks, recreation sites, cemeteries, museums, fairgrounds.

The mineral estate would be reserved by the U.S. in all land disposals except as provided under Sections 206 and 209 of FLPMA. These sections state that mineral exchanges and sales could be considered on an individual basis when in the public interest or when the mineral values are shown to be absent or insignificant. Mineral exchanges would be considered either separately or in conjunction with the surface estate.

TABLE 2-17
POSSIBLE RECREATION AND PUBLIC PURPOSES ACREAGE BY COUNTY

COUNTY	POTENTIAL ACREAGE
Custer	81
Carter	130
Powder River	80
Rosebud	40
Treasure	0
Big Horn	0
Total	331

Wilderness

Zook Creek WSA (8,438 acres) and Buffalo Creek WSA (5,650 acres) would be recommended as not suitable for wilderness designation. The short term is defined as ten years. The long term is considered over ten years.

Zook Creek (#MT-027-701)

The Zook Creek WSA contains 464 million tons of coal with development potential. Of the total, 4,000 acres containing 173 million tons of coal would be available for further consideration pending application of the multiple use screen. The other 4,438 acres containing 291 million tons would be deleted under unsuitability Criterion 15 due to wildlife habitat.

Oil and gas leasing would continue on the entire WSA. No on-site seismic exploration or development is expected to occur, although most of the WSA was under lease as of July 1983.

Vegetative management would continue and provide 1,083 AUMs for livestock grazing and 3,249 AUMs for wildlife watershed and other nonconsumptive uses in the short and long term. The allotments in the WSA are categorized as "M" allotments.

No new improvements would be constructed but maintenance of existing projects using mechanized equipment would not be constrained.

The area would be open to ORV use. This use is expected to continue at 25 visitor days per year.

Timber harvest would be permitted. No commercial harvest is expected to occur. Incidental post and pole cutting is expected to occur in the long term.

Buffalo Creek WSA (#MT-027-702)

The 5,650 acres contain 55 million tons of coal with development potential. Another 15 million tons immediately outside the WSA are attached to the WSA coal resource because of legal subdivisions. These 70 million tons of coal would be available for further consideration for leasing, pending further study and application of the multiple use screen.

Oil and gas leasing would continue on the entire WSA. Some on-site seismic exploration is expected to occur. No drilling is expected to occur, although 88% of the WSA was under lease as of July 1983.

The entire WSA is included within a nonfunctional AMP and is in the "I" category. Vegetative management would continue and would provide 1,108 AUMs in the short term and 1,252 AUMs in the long term for livestock grazing. There would be 3,324 AUMs in the short term and 3,756 AUMs in the long term for wildlife watershed and nonconsumptive uses. Range improvements would be built to upgrade 689 acres of range to good condition, of which 587 acres have potential for mechanical treatments.

Construction and maintenance of range improvements using mechanized equipment would be allowed. A fence, approximately two miles in length, would be considered under the allotment management plan.

The area would be open to ORV use and would continue to be administered under the hunter access program (see Glossary). ORV use is expected to continue at 150 visitor days per year.

Timber harvest would be permitted. No commercial harvest is expected to occur. Incidental post and pole cutting is expected to occur in the long term.

Coal

Coal use would be restricted to current leases, those unleased areas brought forward from existing MFPs and emergency leases. Current leases cover 39,391 acres (3.43 billion tons) and are summarized in Table 2-3. Table 2-4 summarizes total coal acres acceptable for further lease consideration in previous planning. These unleased areas, totaling 91,700 acres of federal coal (7.83 billion tons) are Colstrip, Decker, Greenleaf-Miller, Squirrel Creek, Hanging Woman, Moorhead, Otter Creek, and Ashland (Decker-Birney).

Leased and unleased areas total 131,091 acres and contain 11.26 billion tons. These areas are shown on the Alternative A Map in the map pocket.

A total of 91,324 acres (8,138 leased and 83,186 unleased) were brought forward from the 1982 Powder River MFP Amendment, which analyzed four alternatives. The alternatives were: (1) no action, (2) legislated areas only (Northern Cheyenne Exchange and Rattlesnake Exchange), (3) full development, and (4) preferred alternative. Of the 131,091 acres, there remain 8,520 unleased acres which were not addressed in the 1982 MFP Amendment. These are tracts of land in the Ashland, Otter Creek and Decker areas brought forward from the 1979 MFP Update. This acreage was subjected to detailed interagency (BLM, USFS, and State of Montana) multiple use analysis and environmental assessment in 1975. That assessment analyzed three levels of development Northern Great Plains Resources Plan (NGPRP Study). In addition, several subalternatives were analyzed which considered: (1) export only (preferred by the State of Montana), and (2) various combinations of export and mine-mouth conversion.

These 131,091 acres are incorporated into the existing Management Situation and form the major portion of this alternative and are also analyzed in all other alternatives. Because all 131,091 acres are either leased or covered by environmental assessments which analyzed alternatives, NEPA compliance has been obtained. Emergency leases would continue to be issued to maintain current production or avoid a bypass situation on a case-by-case basis. Coal exchanges would only be considered for existing leases, by direction of legislation, or for leases located in alluvial valley floors.

Calculations for coal with development potential are the same as described in the preferred alternative.

The short term of 10 years or less and the long term of 10 to 40 years is the same as in the preferred alternative.

Mitigation measures for reclamation, wildlife, surface and ground water, air quality, cultural and paleontological resources, oil and gas development and other minerals would be the same as described in the preferred alternative.

Vegetation Utilization

Vegetation utilization would be maintained in both the short (five years) and long terms (over 15 years). Current utilizations are 208,083 AUMs for livestock and 624,249 AUMs for wildlife, watershed protection and other nonconsumptive uses for a total of 832,332. Livestock use by individual allotment is shown in Appendix E. Annual maintenance on replacement of range improvements throughout the Resource Area average two wells, 15 reservoirs and pits, two 5-mile pipelines, two 2-mile fences, four spring developments and 300 acres of mechanical treatments. The cost of maintenance on replaced improvements is $267,900 per year. These projects would continue at current levels and would be distributed throughout the Resource Area.

For analysis purposes, the average number of maintenance or replacement projects are projected for a 15-year period and would be 30 wells, 225 reservoirs and pits, 30 five-mile pipelines, 30 two-mile fences, 60 spring developments and 4,500 acres of mechanical treatments. The cost of these improvements would be $4,018,500 (Appendix F).

The present rangeland condition (vegetation and soil) of the range sites in each allotment has been analyzed in relation to the production potential of those range sites, using the SCS Tech Guides for Range Site Criteria as the guideline. Vegetation use has been estimated on the basis of proper use in the current range condition. Management proposals are based on the adequacy of present management and the need for change to improve rangeland condition and develop range site potential.

Vegetation use adjustments would be based on site specific monitoring studies which determine proper use as reflected by trend in plant species composition and soil erosion condition.

Soil, water and air resources would continue to be evaluated as a part of project level planning. Such evaluations consider the significance of a proposed project and the sensitivity of soil, water and air resources. Stipulations would be attached as needed to protect adjacent resources. Soils would be managed to maintain productivity and minimize erosion. Areas with accelerated erosion problems would be managed to improve watershed conditions. Water quality would be monitored and maintained or improved within state and federal standards, and state agencies would be consulted on proposed projects that may significantly affect water quality.

The 27 existing AMPs (see Alternative A map in map pocket) include 148,232 acres of public land. Of these, 12 are functionally completed. The 12 AMPs on 59,698 acres (40%) would continue as summarized in Table 2-14. The 15 nonfunctional AMPs on 88,534 acres and would be fully implemented through revisions, additional developments and monitoring, to become functional AMPs.

Current grazing systems would be continued. These systems include rest and deferred rotation, deferred or seasonal use, short duration grazing, or other methods. Season and number allotments generally have deferred or seasonal use systems. Custodial allotments have seasonal use coordinated with the use of private land, where the public lands are a very small part of the ranch or the management goals could be met with this system.

The management of wildlife habitat would continue at the current level. This consists of monitoring the condition of sites known to be of high value to wildlife and protecting valuable wildlife habitat in the development and implementation of activity plans. Wildlife facilities would be built at the current level. Average annual improvements consist of installing 20 bird ramps, 20 bird nest boxes and 10 goose nesting platforms, constructing one livestock exclosure and stocking two reservoirs with fish. Approximately 5,000 acres with potential to support woody riparian vegetation would receive special management consideration to promote substantial reproduction to assure that mature woody riparian areas approach good or better condition.

Maintaining woody reproduction in riparian areas to provide 30% of the woody species as saplings or younger trees would assure continued age class diversity in the system. This would assure the availability of browse for use by wildlife through winter months. The location of salt, oilers and other developments would be restricted in identified riparian zones.

Prairie dog towns on public land would continue to be inventoried and examined for presence of associated wildlife speices, including threatened or endangered species. Cooperative studies with other agencies, universities and private groups to accomplish inventories and ecological studies would continue. The prairie dog ecosystem is recognized as an integral part of the prairie environment, and its perpetuation would be consistent with multiple use management of public lands. About 2,600 acres or 65 prairie dog towns are known; others undoubtedly exist. They are all managed primarily for wildlife and recreational values. Where prairie dogs are known to damage public and adjoining private rangelands, controls would be carried out on an average of 40 acres per year. Sites are first examined for presence of species of concern or threatened or endangered species.

An annual average of 130 acres of noxious weeds such as leafy spurge, Canada thistle, cocklebur and knapweed would be controlled on a case-by-case basis. Biological control would be considered if proven effective. Special precautions would be taken with the use of pesticides around water sources and crucial wildlife habitat.

All fire suppression activities would take place at current levels. This involves aggressive action on an average of 14 fires, amounting to 500 acres annually. Fires could be allowed to burn if described by an approved prescribed burn plan or modified suppression plan on a case-by-case basis. This prescribed burning would average 20 acres annually.

Prior to the approval of all proposed range improvement projects an interdisciplinary inspection would be done to evaluate the feasibility and impacts of the proposed developments. Recommendations and mitigations are discussed in the field to overcome problems that may exist and these considerations are then taken into account before final approval of the project is given.

Mitigation measures for resource protection of project developments would be the same as described in the preferred alternative.

Lands

Adjustments to the land pattern would be made on a case-by-case basis, which would include consideration of other resource values and be contingent upon a site specific analysis. As no particular tracts are selected for lands actions, no tracts are shown in the Alternative A Map for any action.

BLM would consider proposals from the public and react to other land adjustment proposals. All land actions would be in accordance with federal and state laws and regulations.

Bureau and Departmental Policy would be followed in all land transactions.

Decisions regarding sales and exchanges would include consideration of the following criteria, which are not all-exclusive, but represent major factors: threatened, endangered and sensitive species habitat, riparian areas, fisheries, nesting/breeding habitat for animals, key big game seasonal habitat, developed recreation and recreation access sites, Class A scenery, areas of geologic/paleontological interest, mineral resources, and sites eligible for inclusion on the National Register of Historic Places.

Since 1973 nine sales have been consummated involving 375 acres, most of which were in unauthorized use. Approximately 2% of these lands had been devoted to a use other than grazing, such as barns and cultivation.

Three exchanges have occurred, resulting in 2,799 acres transferred into private ownership with 2,953 acres received into federal ownership. These represented a net gain of 154 acres plus cash equalization payment of $1,940. Approximately 3% of these lands were isolated within an existing cultivated field and their use has been changed to cultivation.

Fourteen parcels aggregating 339 acres have been conveyed under the authority of the Recreation and Public Purposes Act (R&PP). Most of these lands are located near Miles City and have been used for public purposes under assumed authorization since 1890. All of these lands (100%) are being devoted to a use other than grazing.

Based on past land actions the expected land actions are shown in Table 2-18. The short term is two years and long term is seven years.

Approximately 331 acres have been identified, due to close proximity to communities, as having potential for conveyance under the Recreation and Public Purposes Act for community expansion. See Table 2-17. Conveyances under the R&PP Act would be made to qualified applicants (state, county, local governments and nonprofit organizations) on a case-by-case basis. These conveyances usually result in a more beneficial public use such as wildlife reserves, schools and colleges, parks, recreation sites, cemetaries, museums, and fairgrounds.

The mineral estate would be reserved by the U.S. in all land disposals, except as provided under Sections 206 and 209 of FLPMA. These sections state that mineral exchanges and sales could be considered on an individual basis when in the public interest or when the mineral values are shown to be absent or insignificant. Mineral exchanges would be considered either separately or in conjunction with the surface estate.

Wilderness

No suitability recommendation would be made for either Zook Creek or Buffalo Creek WSA. Short term is defined as 10 years or less, long term is considered as over 10 years. The present levels of resource use and management would be continued in the short and long term.

Zook Creek WSA (#MT-027-701)

Oil and gas leasing would continue on the entire WSA. No on-site seismic exploration is expected to occur, although most of the WSA was under lease as of July 1983.

The WSA (8,438 acres) is presently managed primarily as summer range for domestic livestock.

Vegetative management would continue and would provide 1,083 for livestock AUMs and 3,249 AUMs for wildlife, watershed and other nonconsumptive uses in the short and long term.

No new improvements would be constructed. Maintenance of existing projects using mechanized equipment would not be constrained.

The area would be open to ORV use. Use is expected to continue at 25 visitor days per year.

Timber harvest would be permitted. No commercial harvest is expected to occur. Incidental post and pole cutting is expected to occur in the long term.

Buffalo Creek WSA (#MT-027-702)

Oil and gas leasing would continue on the entire WSA. Some on-site seismic exploration is expected to occur. No drilling is expected to occur, although 88% of the WSA was under lease as of July 1983.

The Buffalo Creek WSA (5,650 acres) is presently managed primarily as summer range for livestock grazing and is under a hunter access program. (See Glossary.)

The entire WSA is contained within a nonfunctional AMP. Vegetative management would continue and provide 1,108 AUMs of livestock grazing and 3,324 AUMs for wildlife and nonconsumptive uses on the WSA in the short and long term. Maintenance of range improvements using mechanical equipment would be allowed. A fence, approximately two miles in length, would be constructed under the allotment management plan.

The area would be open to ORV use and would continue to be administered under the hunter access program. ORV use is expected to continue at 150 visitor days per year.

Timber harvest would be permitted. No commercial harvest is expected to occur. Incidental post and pole cutting is expected to occur in the long term.

TABLE 2-18
SHORT AND LONG-TERM LAND ACTIONS IN ALTERNATIVE A

	SHORT TERM (2 Years)			LONG TERM (7 Years)		
Land Act.	Number	Total Acres	Change of Use Acres	Number	Total Acres	Change of Use Acres
Sales	5	200	4	15	640	13
Exchanges	1	960	29	4	3,840	115
R & PP	0	0	0	1	40	40

Coal

Coal leased or acceptable for further lease consideration would include the 39,391 leased acres containing 3.43 billion tons (Table 2-3) and the 91,700 unleased acres containing 7.83 billion tons cleared in previous planning (Table 2-4). An additional 862,500 acres and 53.92 billion tons of unleased coal in new planning would be available for further consideration for leasing, allowing continuation and expansion of the coal industry. Combined leased and unleased areas total 993,591 acres and contain 65.18 billion tons of coal. These areas are shown on the Alternative B Map in the map pocket. Emergency leases would continue to be issued to maintain current production or avoid bypass situations on a case-by-case basis.

Coal exchanges would be considered for existing leases, by direction of legislation, or for leases located in alluvial valley floors. Exchanges would also be considered on a case-by-case basis, using three major criteria: equal value; consolidation of federal mineral ownership; and serving the public interest.

Calculations for coal with development potential are the same as described in the preferred alternative.

The short term of 10 years or less and the long term of 10 to 40 years is the same as in the preferred alternative.

Mitigation measures for reclamation, wildlife, surface and ground water, air quality, cultural and paleontological resources, oil and gas development and other minerals would be the same as described in the preferred alternative.

The four screens, including identification of coal with development potential, surface owner consultation, unsuitability criteria and multiple use analysis, are the same as described in the preferred alternative.

Identification of Coal With Development Potential

A total of 1.74 million acres (excluding National Forest and Indian lands) contain coal with development potential, amounting to 100.27 billion tons. Of this figure, 0.48 million acres and 20.61 billion tons are state and private coal, 0.13 million acres and 11.26 billion tons are federal coal either leased or in previous planning, and 1.13 million acres and 68.40 billion tons are federal coal in new planning. Table 2-5 identifies the acres and tons of federal coal with development potential.

Surface Owner Consultation

As a result of surface owner consultation, 104,421 acres of private surface containing 4.91 billion tons of federal coal with development potential were deleted from further consideration. By county, the acres and tonnages deleted are as shown in Table 2-6.

Unsuitability Criteria

As a result of the unsuitability criteria, 64,081 acres containing 4.94 billion tons of federal coal with development potential were deleted from further leasing consideration (Table 2-7). An additional 38,411 acres were identified where exceptions to some criteria have been or may be applied, where mitigating measures may protect values and still allow mining (Table 2-8). Stream miles with preliminarily identified alluvial valley floors are summarized by county in Table 2-9.

Multiple Use Analysis

As a result of multiple use conflicts, 94,700 acres containing 4.63 billion tons of federal coal were deleted from further leasing consideration. These deleted areas had passed through the unsuitability and surface owner screens. Table 2-10 summarizes results of this analysis.

A total of 342,600 acres containing 24.97 billion tons of federal coal have been found acceptable for further lease consideration (with adequate inventory to fully apply the unsuitability criteria). An additional 519,900 acres containing 28.95 billion tons of federal coal have been found acceptable pending further study. In these areas, wildlife inventories were incomplete and the wildlife related criteria (#9-15) were not applied; however, the nonwildlife criteria were applied. Wildlife inventories need to be completed and unsuitable areas deleted before these areas can be cleared (Table 2-11).

Vegetation Utilization

In the short term, (five years), vegetation utilization for livestock would be 208,083 AUMs with wildlife, watershed protection and other nonconsumptive uses receiving 624,249 AUMs for a total 832,332. In the long term (over 15 years), vegetation utilization for livestock would be 233,387 AUMs (a 25,304 AUM increase) with wildlife, watershed protection and other nonconsumptive uses receiving 700,161 AUMs (a 75,912 AUM increase) for a total of 933,548. Livestock use by individual allotment is shown in Appendix E.

Based on new range improvements expected AUM increase and proper grazing management, allotment adjustments would be considered following a monitoring period of up to five years and the cooperation of the operator. Insignificant livestock adjustments would be allowed using a shorter monitoring period.

This alternative calls for upgrading 160,024 acres of selected public rangeland to good condition by using more intensive grazing management and range improvements. The lands to be upgraded are shown on the Alternative B Map in the map pocket. A transparent overlay showing allotment boundaries can be used to find specific allotments when placed over the alternative map. A total of 125,023 of the acreage to be upgraded would have potential for mechanical treatments.

The 27 existing AMPs would be continued with up to 72 potential activity plans implemented on 215,905 acres. The 72 were selected by considering acreage, range condition, potential for improvement, public land percentage, watershed and wildlife habitat.

Mechanical treatments would be used where grazing systems may not help on 125,023 acres. Mechanical treatments could include scalping, chiseling, contour furrowing, pitting, ripping, interseeding and chaining. Other land treatment could include herbicides and fire.

Range improvements over a 15-year period would include about 50 management fences, averaging two miles in length, needed to implement grazing systems. There would also be 30 wells, 300 reservoirs or pits, 20 pipelines (five miles/pipeline) and 10 springs developed. Approximately 21 of the proposed water sources identified as having wildlife values would be fenced to prevent livestock use except at the water gaps.

Estimated cost of range improvements would be $6,465,960, based on the current average cost per improvement (Appendix F).

The present rangeland condition (vegetation and soil) of the range sites in each allotment has been analyzed in relation to the production potential of those range sites, using the SCS Tech Guides for Range Site Criteria as the guideline. Vegetation has been allocated on the basis of proper use in the current range condition. Management proposals are based on the adequacy of present management and the need for change to improve rangeland condition and develop range site potential.

Vegetation utilization adjustments would be based on site specific monitoring studies which determine proper use as reflected by trend in plant species composition and soil erosion condition.

Soil, water and air resources would continue to be evaluated as a part of project level planning. Such evaluations consider the significance of a proposed project and the sensitivity of soil, water and air resources. Stipulations would be attached as needed to protect adjacent resources. Soils would be managed to maintain productivity and minimize erosion. Areas with accelerated erosion problems would be managed to improve watershed conditions. Water quality would be monitored and maintained or improved within state and federal standards.

Range condition classification (Table 2-12) and allotment categorization methods are the same as described in the preferred alternative.

Categorization resulted in 174 "M" allotments, 99 "I" allotments and 369 "C" allotments. The acreage for each category is shown in Table 2-13. All "I" allotments would be upgraded to good condition. "M" allotments would either be maintained in good condition or upgraded. "C" allotments would continue under custodial management. Operators are encouraged to contribute to range improvement projects on public land. Range improvements on the "M" and "C" allotments would be handled on a case-by-case basis.

The 27 existing AMPs include 148,232 acres of public land. Of these, 12 are functionally completed. The 12 AMPs on 59,698 acres (40%) would continue as summarized in Table 2-14. The 15 nonfunctional AMPs on 88,534 acres and would be fully implemented through revisions, additional developments and monitoring to become functional AMPs.

Various grazing systems would be applied. These systems include rest and deferred rotation, deferred or seasonal use, short duration grazing, or other methods. Season and number allotments would generally have deferred or seasonal use systems. Custodial allotments would have seasonal use coordinated with the use of private land, where the public lands are a very small part of the ranch or the management goals could be met with this system.

The management of wildlife habitat would continue at the current level. This consists of monitoring the condition of sites known to be of high value to wildlife and protecting valuable wildlife habitat in the development and implementation of activity plans. Wildlife facilities would be built at the current level. Average annual improvements consist of installing 20 bird ramps, 20 bird nest boxes and 10 goose nesting platforms, constructing one livestock exclosure and stocking two reservoirs with fish.

Approximately 5,000 acres with potential to support woody riparian vegetation would receive special management consideration to promote substantial reproduction to assure that mature woody riparian areas approach good or better condition.

Maintaining woody reproduction in riparian areas to provide 30% of the woody species as saplings or younger trees would assure continued age class diversity in the system. This would assure the availability of browse for use by wildlife through winter months. The location of salt, oilers and other developments would be restricted in identified riparian zones.

Prairie dog towns on public land would continue to be inventoried and examined for presence of associated wildlife species, including threatened or endangered species. Cooperative studies with other agencies, universities and private groups to accomplish inventories and ecological studies would continue. The prairie dog ecosystem is recognized as an integral part of the prairie environment, and its perpetuation would be consistent with multiple use management of public lands. About 2,600 acres or 65 prairie dog towns are known; others undoubtedly exist. They are all managed primarily for wildlife and recreational values. Where prairie dogs are known to damage public and adjoining private rangelands, controls would be carried out on an average of 40 acres per year. Sites are first examined for presence of species of concern or threatened or endangered species.

An annual average of 130 acres of noxious weeds such as leafy spurge, Canada thistle, cocklebur and knapweed would be controlled on a case-by-case basis. Biological control would be considered if proven effective. Special precautions would be taken with the use of pesticides around water sources and crucial wildlife habitat.

All fire suppression activities would take place at current levels. This involves aggressive action on an average of 14 fires, amounting to 500 acres annually. Fires could be allowed to burn if described by an approved prescribed burn plan or modified suppression plan, on a case-by-case basis. Prescribed burning would average 20 acres annually.

Prior to the approval of all proposed range improvement projects an interdisciplinary inspection would be done to evaluate the feasibility and impacts of the proposed developments. Recommendations and mitigations are discussed in the field to overcome problems that may exist and these considerations are then taken into account before final approval of the project is given.

Mitigating measures for resource protection on project developments would be the same as described in the preferred alternative.

Lands

A total of 165,054 acres of public land would be categorized as having potential for disposal as shown on the Alternative B Map in the map pocket. These lands would be equally considered for sale, exchange, exchange pooling or jurisdictional transfer to other federal agencies. In addition to these lands, BLM would consider proposals from the public and react to other land adjustment proposals. All land actions would be in accordance with federal and state laws and regulations. Bureau and Departmental policy would be followed in all land transactions. The lands are categorized into three divisions: retention, disposal, and further study. This categorization of lands would be used as a guideline, but flexibility would be retained to allow a case-by-case appraisal of any land or mineral transaction. Categorization is shown in Table 2-15.

Criteria for categorization are contained in Appendix G. For analysis purposes lands actions on 47,158 acres can be expected in the short term (two years) and 165,054 acres in the long term (seven years), with 51,064 acres (31%) having potential for a change of use based on the average of class III and IV lands. Potential land actions are shown in Table 2-19.

Land exchanges can be consummated by two parties to consolidate private and federal inholdings or by exchange pooling involving three or more parties. Exchange pooling can result in the exchange of several isolated tracts of public land for more desirable areas, resulting in increased management efficiency and economic return to the public in the short and long term.

TABLE 2-19
SHORT AND LONG-TERM LAND ACTIONS IN ALTERNATIVE B

	SHORT TERM (2 Years)			LONG TERM (7 Years)		
Land Actions	Total Acres	(%)	Change of Use Acres	Total Acres	(%)	Change of Use Acres
Sales	23,579	50%	7,310	82,362	50%	25,532
Exchanges, exchange pooling or jurisdictional transfers	23,579	50%	7,309	82,361	50%	25,532
Total	47,158		14,619	164,723*		51,064

*The 331 acres which have potential for conveyance under the Recreation and Public Purposes Act are not included and are discussed in Table 2-17.

Lands exchanged must be equal in value or the values equalized by monies by either party, not to exceed 25% of the appraised value.

The criteria for the types of land to be selected through exchange, the criteria for public land disposal and the criteria for jurisdictional transfer would be the same as described in the preferred alternative.

Approximately 331 acres have been identified, due to close proximity to communities, as having potential for conveyance under the Recreation and Public Purposes Act for community expansion. See Table 2-17. Conveyances under the R & PP Act would be made to qualified applicants (state, county, local governments and nonprofit organizations) on a case-by-case basis. These conveyances usually result in a more beneficial public use such as wildlife reserves, schools and colleges, parks, recreation sites, cemeteries, museums and fairgrounds.

The mineral estate would be reserved by the U.S. in all land disposals except as provided under Sections 206 and 209 of FLPMA. These sections state that mineral exchanges and sales could be considered on an individual basis when in the public interest or when the mineral values are shown to be absent or insignificant. Mineral exchanges would be considered either separately or in conjunction with the surface estate.

Wilderness

The Zook Creek WSA (8,438 acres) would be recommended as suitable for wilderness. The Buffalo Creek WSA (5,650 acres) would be recommended as not suitable for wilderness designation. Short term is defined as 10 years or less and long term is considered over 10 years.

Zook Creek (#MT-027-701)

The WSA contains 464 million tons of coal with development potential. The entire WSA would be deleted from coal development consideration, based on unsuitability criteria 4 and 5, which deal with wilderness and visual resources. Of this total, 4,438 acres of the WSA containing 291 million tons would be deleted also due to wildlife habitat under unsuitability criterion 15.

Oil and gas development would be allowed on 5,831 acres of pre-FLPMA leases. If not producing, the last of those leases would expire in October 1985 and not be sold again. If producing, the leases would not expire.

Oil and gas development would be allowed on 2,607 acres of post-FLPMA leases, if it would not impair wilderness values. Those leases would expire by 1993, unless producing.

The wilderness manageability of Zook Creek could be impaired by pre-FLPMA oil and gas leases and indirect conflicts from offsite coal development. No new leases would be issued. No current leases are producing or are expected to be developed.

Vegetative management would continue and would provide 1,083 AUMs for livestock grazing and 3,249 AUMs for wildlife, watershed and other nonconsumptive uses on the WSA in the short term and long term, because this allotment is in the "M" category. Maintenance of existing improvements using mechanized equipment would be generally prohibited.

The area would be closed to ORV use. Twenty-five visitor days of ORV use would not be allowed to continue.

Timber harvest including incidental post and pole cutting would not be permitted within the area.

Designation of the Zook Creek area as wilderness would be a federal undertaking to which federal regulations (36 CFR 800 and Sec. 110 of NEPA) would apply. A management decision to remove, maintain, or allow historic and prehistoric sites to deteriorate is an undertaking which affects the cultural resource. Identification of sites eligible to the National Register of Historic Places and evaluation of the effect of the wilderness management decision on such sites must be made in consultation with the Advisory Council on Historic Preservation and the State Historic Preservation Officer. Protective measures for Register eligible sites could include mitigation through data retrieval, preservation or nondisturbance. The WSA can generally be managed as wilderness but manageability could be impaired by indirect conflicts from coal development.

Buffalo Creek WSA (#MT-027-702)

There would be no prohibition on mineral leasing.

The 5,650 acres contain 55 million tons of coal with development potential. Another 15 million tons immediately outside the WSA are attached to the WSA coal resource because of legal subdivisions. These 70 million tons of coal would be available for further consideration for leasing, pending further study and application of the multiple use screen.

Oil and gas leasing would continue on the entire WSA. Some on-site seismic exploration is expected to occur. No drilling is expected to occur, although 88% of the WSA was under lease as of July 1983.

The entire WSA is included within a nonfunctional AMP. Range improvements would be built to upgrade 689 acres of range to good condition of which 587 acres have potential for mechanical treatments. Allocations would be 1,108 AUMs in the short term and 1,252 AUMs in the long term for livestock grazing.

There would be 3,324 AUMs in the short term and 3,756 AUMs in the long term for wildlife and nonconsumptive uses. Maintenance of range improvements using mechanized equipment would be allowed. A fence, approximately two miles in length, would be constructed under the allotment management plan. This is an "I" category allotment.

The area would be open to ORV use and would continue to be administered under the hunter access program (see Glossary). ORV use is expected to continue at 150 visitor days per year.

Timber harvest would be permitted. No commercial harvest is expected to occur. Incidental post and pole cutting is expected to occur in the long term.

Coal

Coal leased or acceptable for further lease consideration would include the 39,391 leased acres containing 3.43 billion tons (Table 2-3) and the 91,700 unleased acres containing 7.83 billion tons cleared in previous planning (Table 2-4). An additional 957,200 acres and 58.55 billion tons of unleased coal in new planning which passed through the coal potential, surface owner and unsuitability screens as discussed in the preferred alternative would be available for further consideration for leasing with minimal acreage or tonnage dropped because of multiple use conflict (See Table 2-20). This approach is designed to offer the widest selection of coal for future development that regulations and policy will allow. Using this approach, multiple uses other than those already considered through the unsuitability screen are offset by the value of the coal resource.

TABLE 2-20
FEDERAL COAL ACCEPTABLE FOR FURTHER CONSIDERATION IN ALTERNATIVE C

	Coal Acceptable For Further Consideration With Adequate Inventory		Coal Acceptable For Further Consideration Pending Further Study		Total Coal Acceptable For Further Consideration	
County	Acres	Tons (billion)	Acres	Tons (billion)	Acres	Tons (billion)
Big Horn	95,000	9.81	143,200	12.80	238,200	22.63
Rosebud	67,900	4.60	83,200	4.70	151,100	9.30
Treasure	2,400	0.05	400	0.01	2,800	0.06
Custer	18,100	0.57	31,600	0.61	49,700	1.19
Powder River	186,800	11.90	328,600	13.50	515,400	25.37
Total	370,200	26.93	587,000	31.62	957,200	58.55

Combined leased and unleased areas total 1,088,291 acres and contain 69.81 billion tons of coal. These areas are shown on the Alternative C Map in the map pocket. Emergency leases would continue to be issued to maintain current production or avoid bypass situations on a case-by-case basis. Coal exchanges would be considered for existing leases, by direction of legislation, or for leases located in alluvial valley floors. Exchanges would also be considered on a case-by-case basis, using three major criteria: equal value; consolidation of federal mineral ownership; and serving the public interest.

Calculations for coal with development potential are the same as described in the preferred alternative.

The short term of 10 years or less and the long term of 10 to 40 years is the same as in the preferred alternative.

Mitigation measures for reclamation, wildlife, surface and ground water, air quality, cultural and paleontological resources, oil and gas development and other minerals would be the same as described in the preferred alternative.

The four screens, including identification of coal with development potential, surface owner consultation, unsuitability criteria and multiple use analysis, are the same as described in the preferred alternative.

Vegetation Utilization

In the short term (five years), vegetation utilization for livestock would be 208,083 AUMs with wildlife, watershed protection and other nonconsumptive uses receiving 624,249 AUMs for a total of 832,332. In the long term (15 years) vegetation utilization for livestock would be 319,269 AUMs (a 111,186 AUM increase) with wildlife, watershed protection and other nonconsumptive uses receiving 957,798 AUMs (a 333,549 AUM increase) for a total of 1,277,067

Livestock use by individual allotment is shown in Appendix E.

Based on new range improvements, expected AUM increase, and proper grazing management, allotment adjustments would be considered following a monitoring period of up to five years and the cooperation of the operator. Insignificant livestock adjustments would be allowed, using a shorter monitoring period.

This alternative calls for upgrading 876,614 acres of selected public rangeland to excellent condition by using more intensive grazing management and range improvement. (The lands to be upgraded are shown on the Alternative C Map in the map pocket. A transparent overlay showing allotment boundaries can be used to find specific allotments when placed over the alternative map.) A total of 518,549 of the acreage to be upgraded have potential for mechanical treatments.

The 27 existing AMPs would be continued, with up to 246 potential activity plans implemented on 781,388 acres.

The 246 were selected by considering acreage, range condition, potential for improvements, public land percentage, watershed and wildlife habitat.

Mechanical treatments would be used where grazing systems may not help on 518,549 acres. Mechanical treatments could include scalping, chiseling, contour furrowing, pitting, ripping, interseeding, and chaining. Other land treatments could include herbicides and fire.

Range improvements over a 15-year period would include about 150 fences, averaging two miles in length, needed to implement grazing systems. There would also be 75 wells, 700 reservoirs or pits, 60 pipelines (five miles/pipeline) and 50 springs developed. Approximately 49 of the proposed water sources identified as having wildlife values would be fenced to prevent livestock use, except at the water gaps.

Estimated cost of range improvements would be $18,043,680, based on current average cost per improvement (Appendix F).

The present rangeland condition (vegetation and soil) of the range sites in each allotment has been analyzed in relation to the production potential of those range sites, using the SCS Tech Guides for Range Site Criteria as the guideline. Vegetation has been allocated on the basis of proper use in the current range condition. Management proposals are based on the adequacy of present management and the need for change to improve rangeland condition and develop range site potential.

Vegetation utilization adjustments would be based on site specific monitoring studies which determine proper use as reflected by trend in plant species composition and soil erosion condition.

Soil, water and air resources would continue to be evaluated as a part of project level planning. Such evaluations consider the significance of a proposed project and the sensitivity of soil, water and air resources. Stipulations would be attached as needed to protect adjacent resources. Soils would be managed to maintain productivity and minimize erosion. Areas with accelerated erosion problems would be managed to improve watershed conditions. Water quality would be monitored and maintained or improved within state and federal standards.

Range condition classification (Table 2-12) and allotment categorization methods are the same as described in the preferred alternative.

Categorization resulted in 174 "M" allotments, 99 "I" allotments and 369 "C" Allotments. The acreage for each category is shown in Table 2-13. All "I" and "M" allotments would be upgraded to excellent condition; "C" allotments would continue under custodial management. Operators would be encouraged to contribute to range improvement projects on public land. Range improvements on the the "C" allotments would be handled on a case-by-case basis.

The 27 existing AMPs include 148,232 acres of public land. Of these, 12 are functionally completed. The 12 AMPs on 59,698 acres (40%) would continue as summarized in Table 2-14. The 15 nonfunctional AMPs on 88,534 acres would be fully implemented through revisions, additional developments and monitoring to become functional AMPs.

Various grazing systems would be applied. These systems include rest and deferred rotation, deferred or seasonal use, short duration grazing, or other methods. Season and number allotments would generally have deferred or seasonal use systems. Custodial allotments would have seasonal use coordinated with the use of private land, where the public lands are a very small part of the ranch or the management goals could be met with this system.

The management of wildlife habitat would continue at the current level. This consists of monitoring the condition of sites known to be of high value to wildlife and protecting valuable wildlife habitat in the development and implementation of activity plans. Wildlife facilities would be built at the current level. Average annual improvements consist of installing 20 bird ramps, 20 bird nest boxes and 10 goose nesting platforms, constructing one livestock exclosure and stocking two reservoirs with fish. Approximately 5,000 acres with potential to support woody riparian vegetation would receive special management consideration to promote substantial reproduction to assure that mature woody riparian areas approach good or better condition.

Maintaining woody reproduction in riparian areas to provide 30% of the woody species as saplings or younger trees would assure continued age class diversity in the system. This would assure the availability of browse for use by wildlife through winter months.

Prairie dog towns on public land would continue to be inventoried and examined for presence of associated wildife species, including threatened or endangered species. Cooperative studies with other agencies, universities and private groups to accomplish inventories and ecological studies would continue. The prairie dog ecosystem is recognized as an integral part of the prairie environment, and its perpetuation would be consistent with multiple use management of public lands. About 2,600 acres or 65 prairie dog towns are known; others undoubtedly exist. They are all managed primarily for wildlife and recreational values. Where prairie dogs are known to damage public and adjoining private rangelands, controls would be carried out on an average of 40 acres per year. Sites are first examined for presence of species of concern or threatened or endangered species.

An annual average of 130 acres of noxious weeds such as leafy spurge, Canada thistle, cocklebur and knapweed would be controlled on a case-by-case basis. Biological control would be considered if proven effective. Special precautions would be taken with the use of pesticides around water sources and crucial wildlife habitat.

All fire suppression activities would take place at current levels. This involves aggressive action on an average of 14 fires amounting to 500 acres annually. Fires could be allowed to burn if prescribed by an approved prescribed burn plan or modified suppression plan on a case-by-case basis. This prescribed burn would average 20 acres annually.

Prior to the approval of all proposed range improvement projects, an interdisciplinary inspection would be done to evaluate the feasibility and impacts of the proposed developments. Recommendations and mitigations are discussed in the field to overcome problems that may exist and these considerations are then taken into account before final approval of the project is given.

Mitigating measures for resource protection on project developments would be the same as described in the preferred alternative.

Lands

A total of 165,054 acres of public land would be categorized as having potential for disposal as shown on the Alternative C Map in the map pocket. Sales of 75% of these lands would be emphasized, while exchange, exchange pooling and jurisdictional transfer to other federal agencies would be limited to 25% of these lands.

In addition to these lands, BLM would consider proposals from the public and react to other land adjustment proposals. All land actions would be in accordance with federal and state laws and regulations. Bureau and Departmental policy would be followed in all land transactions.

The lands are categorized into three divisions: retention, disposal, and further study. This categorization of lands would be used as a guideline, but flexibility would be retained to allow a case-by-case appraisal of any land or mineral transaction. Categorization is shown in Table 2-15. Criteria for categorization are contained in Appendix G.

For analysis purposes lands actions on 47,158 acres can be expected in the short term (two years) and 165,054 acres in the long term (seven years),with 51,064 acres (31%) having potential for a change of use, based on the average of Class III and IV lands shown in Table 2-21.

Land exchanges can be consummated by two parties to consolidate private and federal inholdings or by exchange pooling involving three or more parties. Exchange pooling can result in the exchange of several isolated tracts of public land for more desirable areas, resulting in increased management efficiency and economic return to the public in the short and long term.

Lands exchanged must be equal in value or the values equalized by monies by either party, not to exceed 25% of the appraised value.

The criteria for the types of land to be selected through exchange, the criteria for public land disposal, and the criteria for jurisdictional transfer would be the same as described in the preferred alternative.

Approximately 331 acres have been identified, due to close proximity to communities, as having potential for conveyance under the Recreation and Public Purposes Act for community expansion. See Table 2-17. Conveyances under the R&PP Act would be made to qualified applicants (state, county, local governments and nonprofit organizations) on a case-by-case basis. These conveyances usually result in a more beneficial public use such as wildlife reserves, schools and colleges, parks, recreation sites, cemeteries, museums and fairgrounds.

TABLE 2-21
SHORT AND LONG-TERM LAND ACTIONS IN ALTERNATIVE C

	SHORT TERM (2 Years)			LONG TERM (7 Years)		
Land Actions	Total Acres	(%)	Change of Use Acres	Total Acres	(%)	Change of Use Acres
Sales	35,369	75	10,964	123,542	75	38,298
Exchanges, exchange pooling or jurisdictional transfers	11,789	25	3,655	41,181	25	12,766
Total	47,158		14,619	164,723*		51,064

*The 331 acres which have potential for conveyance under the Recreation and Public Purposes Act are not included and are discussed in Table 2-17.

The mineral estate would be reserved by the U.S. in all land disposals except as provided under Sections 206 and 209 of FLPMA. These sections state that mineral exchanges and sales could be considered on an individual basis when in the public interest or when the mineral values are shown to be absent or insignificant. Mineral exchanges would be considered either separately or in conjunction with the surface estate.

Wilderness

Both Zook Creek WSA (8,438 acres) and Buffalo Creek WSA (5,650 acres) would be recommended as not suitable for wilderness designation. The short term is defined as ten years or less; the long term is considered over 10 years.

Zook Creek (#MT-027-701)

The WSA contains 464 million tons of coal with development potential. Of the total, 4,000 acres containing 173 million tons of coal would be available for further consideration for leasing. Another 4,438 acres containing 291 million tons would be deleted due to wildlife habitat under unsuitability criterion 15.

Oil and gas leasing would continue on the entire WSA. No on-site seismic exploration or development is expected to occur, although most of the WSA was under lease as of July 1983.

Vegetative management would continue and would provide 1,083 AUMs in the short term and 2,304 AUMs in the long term for livestock grazing on the WSA. It would also provide 3,249 AUMs in the short term and 6,912 AUMs in the long term for wildlife, watershed and nonconsumptive uses. Range improvements would be built to upgrade 7,929 acres of range to excellent condition. A total of 1,746 acres have potential for mechanical treatment. Construction and maintenance of range improvements using mechanized equipment would be allowed since the allotment is in the "M" category.

The area would be open to ORV use. This use is expected to continue at 25 visitor days per year.

Timber harvest would be permitted. No commercial harvest is expected to occur. Incidental post and pole cutting is expected to occur in the long term.

Buffalo Creek WSA (#MT-027-702)

The 5,650 acres contain 55 million tons of coal with development potential. Another 15 million tons immediately outside the WSA are attached to the WSA coal resource because of legal subdivisions. For analysis purposes only, these 70 million tons of coal would be available for further consideration for leasing, pending further study.

Oil and gas leasing would continue on the entire WSA. Some on-site seismic exploration is expected to occur. No drilling is expected to occur, although 88% of the WSA was under lease as of July 1983.

The entire WSA is included within a nonfunctional AMP.

Vegetative management would continue and would provide 1,108 AUMs in the short term and 1,680 AUMs in the long term of livestock grazing on the WSA. There would be 3,324 AUMs in the short term and 5,040 AUMs in the long term for wildlife and nonconsumptive uses. A total of 4,972 acres would be upgraded to excellent condition of which 1,783 acres would have potential for mechanical treatment. Construction and maintenance of range improvements using mechanized equipment would be allowed. The allotment is in the "I" category.

A fence, approximately two miles in length, would be constructed under the allotment management plan. The area would be open to ORV use and would continue to be administered under the hunter access program (see Glossary). ORV use is expected to continue at 150 visitor days per year.

Timber harvest would be permitted. No commercial harvest is expected to occur in the long term.

Coal

Current leases totaling 39,391 acres and 3.43 billion tons of coal mentioned in Alternative A would remain in effect (Table 2-3). Any additional leasing would be restricted to emergency leases used to maintain current production or to avoid a bypass situation on a case-by-case basis. Exchanges would only be considered for existing leases, by direction of legislation, or for leases located in alluvial valley floors.

Leases in effect as of 1983 are shown on the Alternative D Map in the map pocket.

Operating mines include Colstrip, Big Sky, East and West Decker, and Spring Creek. Any new mines would be confined to those on private coal (Montco and various local operators), those resulting from legislated exchanges (CX Ranch, Peabody, Greenleaf-Miller) and those on existing nondeveloped leases (Wolf Mountain, CX Ranch, Shell-Pearl, Cook Mountain, and Coal Creek). Unleased tracts cleared in previous planning (Hanging Woman, Mud Springs, Downey Coulee, Northwest Otter Creek and Ashland Decker-Bimey) would neither be leased nor mined.

Calculations for coal with development potential are the same as described in the preferred alternative.

The short term of 10 years or less and the long term of 10 to 40 years is the same as in the preferred alternative.

Mitigation measures for reclamation, wildlife, surface and ground water, air quality, cultural and paleontological resources, oil and gas development and other minerals would be the same as described in the preferred alternative.

Vegetation Utilization

Emphasis would be placed on wildlife and watershed values. Based on monitoring, a 30,592 AUM reduction would be implemented for livestock (Table 2-22). In the short term (five years), vegetation utilization for livestock would be targeted at 177,491 AUMs with wildlife, watershed protection and other nonconsumptive uses received 654,841 AUMs for a total of 832,332. In the long term (over 15 years) vegetation utilization for livestock would be 232,608 AUMs (a 55,117 AUM increase). Wildlife, watershed protection and other nonconsumptive uses would receive 701,727 AUMs (a 46,886 AUM increase) totaling 934,335 AUMs. Livestock use by individual allotment is shown in Appendix E.

Reductions were made for watershed/soils and wildlife protection in the short term on 526 allotments in less than good condition through spring deferments during April, May and June and seasonal deferments at various times of the year (Appendix H).

TABLE 2-22
REDUCTIONS IN LIVESTOCK USE

Type Reduction Allocated To:	AUMs	Number of Allotments*
Watershed	13,855	477
Resource Protection	15,171	257
Wildlife	1,566	52
TOTAL	30,592	

*Individual allotments may be counted more than once.

After reductions were made for watershed/soils and wildlife protection, several allotments had to be reduced further so that licensed use would not exceed the current available AUMs as indicated by the range condition survey. In the long term, watershed/soils protection would not require AUM reductions, because proper management should bring those lands up to good condition and AUMs would be returned to livestock.

Based on new range improvements, expected AUMs increase and proper grazing management, allotment adjustments would be considered following a five-year monitoring period and the cooperation of the operator. Insignificant livestock adjustments would be allowed using a shorter monitoring period. However, wildlife protection reductions would be carried into the long term.

This alternative calls for upgrading 314,469 acres of selected public rangeland to good condition by using more intensive grazing management and range improvements. The lands to be upgraded are shown on Alternative D Map in the map pocket. A transparent overlay showing allotment boundaries can be used to find specific allotments when placed over the alternative map. A total of 234,367 acres would have potential for mechanical treatments. Of that, 125,023 acres would have potential to be mechanically treated for watershed enhancement purposes.

The 27 existing AMPs would be continued with up to 72 potential activity plans implemented on 215,905 acres. The 72 were selected by considering acreage, range condition, potential for improvements, public land percentage, watershed and wildlife habitat.

Mechanical treatments would be used where grazing systems may not help on 125,023 acres. Mechanical treatments could include scalping, chiseling, contour furrowing, pitting, ripping, interseeding, and chaining. Other land treatments could include herbicides and fire.

Range improvements over a 15-year period would include about 50 management fences averaging two miles in length, needed to implement grazing systems. There would also be 30 wells, 300 reservoirs or pits, 20 pipelines (five miles/pipeline) and 10 springs developed. Approximately 21 of the proposed water sources identified as having wildlife values would be fenced to prevent livestock use except at the water gaps.

Most land treatments and range projects would be implemented with emphasis on project designs and techniques offering the most benefit to wildlife and watershed values.

Estimated cost of range improvements would be $6,465,960 based on the current average cost per improvement (Appendix F).

The present rangeland condition (vegetation and soil) of the range sites in each allotment has been analyzed in relation to the production potential of those range sites using the SCS Tech Guides for Range Site Criteria as the guideline.

Vegetation has been allocated on the basis of proper use in the current range condition. Management proposals are based on the adequacy of present management and the need for change to improve rangeland condition and develop range site potential.

Vegetation utilization adjustments would be based on site specific monitoring studies which determine proper use as reflected by trend in plant species composition and soil erosion condition.

Soil, water and air resources would continue to be evaluated as a part of project level planning. Such evaluations consider the significance of a proposed project and the sensitivity of soil, water and air resources. Stipulations would be attached as needed to protect adjacent resources. Soils would be managed to maintain productivity and minimize erosion. Areas with accelerated erosion problems would be managed to improve watershed conditions. Water quality would be monitored and maintained or improved within state and federal standards.

Range condition classification (Table 2-12) and allotment categorization methods are the same as described in the preferred alternative.

Categorization resulted in 174 "M" allotments, 99 "I" and 369 "C" allotments. The acreage for each category is shown in Table 2-13. All "I" and "C" allotments would be upgraded to good condition. Operators would be encouraged to contribute to range improvement projects on public land. Range improvements on the "M" and "C" allotments would be handled on a case-by-case basis.

There are 27 existing Allotment Mangement Plans (AMPs) including 148,232 acres of public land. Of these, 12 are functionally completed. The 12 AMPs on 59,698 acres (40%) would continue as summarized in Table 2-14. The 15 nonfunctional AMPs on 88,534 acres would be fully implemented through revisions, additional developments, and monitoring to become functional AMPs.

Various grazing systems would be applied. These systems include rest and deferred rotation, deferred or seasonal use, short duration grazing, or other methods. Season and number allotments would generally have deferred or seasonal use systems. Custodial allotments would have seasonal use coordinated with the use of private land, where the public lands are a very small part of the ranch or the management goals could be met with this system.

The management of wildlife habitat would remain at the current level. This consists of monitoring the condition of sites known to be of high value to wildlife and protecting valuable wildlife habitat in the development and implementation of activity plans. Wildlife facilities would be built at the current level. Average annual improvements consist of installing 20 bird ramps, 20 bird nest boxes and 10 goose nesting platforms, constructing one livestock exclosure and stocking two reservoirs with fish. Approximately 5,000 acres with potential to support woody riparian vegetation would receive special management consideration to promote substantial reproduction to assure that mature woody riparian areas approach good or better condition.

Maintaining woody reproduction in riparian areas to provide 30% of the woody species as saplings or younger trees would assure continued age class diversity in the system. This would assure the availability of browse for use by wildlife through winter months.

Prairie dog towns on public land would continue to be inventoried and examined for presence of associated wildlife species, including threatened or endangered species. Cooperative studies with other agencies, universities and private groups to accomplish inventories and ecological studies would continue. The prairie dog ecosystem is recognized as an integral part of the prairie environment, and its perpetuation would be consistent with multiple use management of public lands. About 2,600 acres or 65 prairie dog towns are known; others undoubtedly exist. They are all managed primarily for wildlife and recreational values. Where prairie dogs are known to damage public and adjoining private rangelands, controls would be carried out on an average of 40 acres per year. Sites are first examined for presence of species of concern or threatened or endangered species.

An annual average of 130 acres of noxious weeds such as leafy spurge, Canada thistle, cocklebur and knapweed would be controlled on a case-by-case basis. Biological control would be considered if proven effective. Special precautions would be taken with the use of pesticides around water sources and crucial wildlife habitat.

All fire suppression activities would take place at current levels. This involves aggressive action on an average of 14 fires, amounting to 500 acres annually. Fires could be allowed to burn if described by an approved prescribed burn plan or modified suppression plan, on a case-by-case basis. This prescribed burning would average 20 acres annually.

Prior to the approval of all proposed range improvement projects, an interdisciplinary inspection would be done to evaluate the feasibility and impacts of the proposed developments. Recommendations and mitigations are discussed in the field to overcome problems that may exist and these considerations are then taken into account before final approval of the project is given.

Mitigating measures for resource protection on project developments would be the same as described in the preferred alternative.

Lands

A total of 165,054 acres of public land would be categorized as having potential for disposal as shown on the Alternative D Map in the map pocket. Exchange and exchange pooling would be emphasized on 75% of these lands, with some jurisdictional transfers to other federal agencies considered on a case-by-case basis. Disposal by sale would be de-emphasized and considered only on 25% of these lands.

In addition to these lands, BLM would consider proposals from the public and react to other land adjustment proposals. All land actions would be in accordance with federal and state laws and regulations. Bureau and Departmental policy would be followed in all land transactions. The lands are categorized into three divisions: retention, disposal, and further study. This categorization of lands would be used as a guideline, but flexibility would be retained to allow a case-by-case appraisal of any land or mineral transaction. Categorization is shown in Table 2-15.

Criteria for categorization are contained in Appendix G. For analysis purposes land actions on 47,158 acres can be expected in the short term (two years) and 165,054 acres in the long term (seven years), with 51,064 acres (31%) having potential for a change of use based on the average of Class III and IV lands. Potential land actions are as shown in Table 2-23.

Land exchanges can be consummated by two parties to consolidate private and federal inholdings or by exchange pooling involving three or more parties. Exchange pooling can result in the exchange of several isolated tracts of public land for more desirable areas, resulting in increased management efficiency and economic return to the public in the short and long term.

Lands exchanged must be equal in value or the values equalized by monies by either party not to exceed 25% of the appraised value.

The criteria for the types of land to be selected through exchange, the criteria for public land disposal, and the criteria for jurisdictional transfer would be the same as described in the preferred alternative.

Approximately 331 acres have been identified, due to close proximity to communities, as having potential for conveyance under the Recreation and Public Purposes Act (R & PP) for community expansion. See Table 2-17. Conveyances under the R & PP Act would be made to qualified applicants (state, county, local governments and nonprofit organizations) on a case-by-case basis. These conveyances usually result in a more beneficial

TABLE 2-23
SHORT AND LONG-TERM LAND ACTIONS IN ALTERNATIVE D

	SHORT TERM (2 Years)			LONG TERM (7 Years)		
Land Actions	Total Acres	(%)	Change of Use Acres	Total Acres	(%)	Change of Use Acres
Sales	11,789	25	3,655	41,181	25	12,766
Exchanges, exchange pooling or jurisdictional transfers	35,369	75	10,964	123,542	75	38,298
Total	47,158		14,619	164,723*		51,064

*The 331 acres which have potential for conveyance under the Recreation and Public Purposes Act are not included and are discussed in Table 2-17.

public use such as wildlife reserves, schools and colleges, parks, recreation sites, cemeteries, museums and fairgrounds.

The mineral estate would be reserved by the U.S. in all land disposals except as provided under Sections 206 and 209 of FLPMA. These sections state that mineral exchanges and sales could be considered on an individual basis when in the public interest or when the mineral values are shown to be absent or insignificant. Mineral exchanges would be considered either separately or in conjunction with the surface estate.

Wilderness

Zook Creek WSA (8,438 acres) and Buffalo Creek WSA (5,650 acres) would be recommended as suitable for wilderness. Short term is defined as ten years or less. The long term is considered over ten years.

Zook Creek WSA (#MT-027-701)

The WSA contains 464 million tons of coal with development potential. The entire WSA would be deleted from coal development consideration based on unsuitability criteria 4 and 5, which deal with wilderness and visual resources. Of this total, 4,438 acres of the WSA, containing 291 million tons, would also be deleted due to wildlife habitat under unsuitability criterion 15.

Oil and gas development would be allowed on 5,831 acres of pre-FLPMA leases. If not producing, the last of those leases would expire in October 1985 and leases would not be sold again. If producing, the leases would not expire.

Oil and gas development would be allowed on 2,607 acres of post-FLPMA leases, if it would not impair wilderness values. Those leases would expire by 1993, unless producing. The wilderness manageability of Zook Creek could be impaired by pre-FLPMA oil and gas leases.

No new leases would be issued. No current leases are producing or are expected to be developed.

Vegetative management would continue and would provide 1,083 AUMs for livestock grazing and 3,244 AUMs for wildlife, watershed and other nonconsumptive uses on the WSA in the short and long term, since the allotments are in the "M" category. No new improvements would be constructed. Maintenance of existing improvements using mechanized equipment would be generally prohibited.

The area would be closed to ORV use. Twenty-five visitor days of ORV use would not be allowed to continue.

Timber harvest including incidental post and pole cutting would not be permitted within the area.

Designation of the Zook Creek area as wilderness would be a federal undertaking to which federal regulations (36 CFR 800 and Section 110 of NEPA) would apply. A management decision to remove, maintain, or allow historic and prehistoric sites to deteriorate is an undertaking which affects the cultural resource. Identification of sites eligible to the National Register of Historic Places and evaluation of the effect of the wilderness management decision on such sites must be made in consultation with the Advisory Council on Historic Preservation and the State Historic Preservation Officer. Protective measures for Register eligible sites could include mitigation through data retrieval, preservation or nondisturbance.

The WSA can be generally managed as wilderness.

Buffalo Creek WSA (#MT-027-702)

The WSA contains 55 million tons of coal with development potential. Another 15 million tons immediately outside the WSA are attached to the WSA coal resource because of legal subdivisions. A total of 5,933 acres within and adjacent to the WSA contain 70 million tons of coal with development potential which would be deleted from coal development consideration based on unsuitability criteria 4 and 5. These criteria deal with wilderness and visual resources (see Appendix D).

Oil and gas development would be allowed on 5,012 acres of post-FLPMA leases if it would not impair wilderness values. Those leases will expire by 1993, unless producing. No new leases would be issued. No current leases are producing or are expected to be developed.

The entire WSA is contained within a nonfunctional AMP. Vegetative management would continue and provide 1,108 AUMs for livestock grazing and 3,324 AUMs for wildlife and nonconsumptive use on the WSA in the short term and long term. No new improvements would be constructed. Maintenance of existing improvements using mechanized equipment would be generally prohibited. A fence, approximately two miles in length, would be built. This is an "I" category allotment.

The area would be closed to ORV use. A total of 150 visitor days of ORV use would not be allowed to continue.

Designation of the Buffalo Creek area as wilderness would be a federal undertaking to which federal regulations (36 CFR 800 and Section 110 of NEPA) would apply. A management decision to remove, maintain or allow historic and prehistoric sites to deteriorate is an undertaking which affects the cultural resource. Identification of sites eligible to the National Register of Historic Places and evaluation of the effect of the wilderness management decision on such sites must be made in consultation with the Advisory Council on Historic Preservation and the State Historic Preservation Officer. Protective measures for Register eligible sites could include mitigation through data retrieval, preservation or nondisturbance.

There are generally no conflicts to prevent wilderness management.

SUMMARY OF CUMULATIVE IMPACTS

Table 2-24, Summary of Cumulative Impacts, is an abbrievated display of impacts addressing each alternative, as required by regulation. The full description of impacts is contained in Chapter 4.

WORST CASE ANALYSIS

Discussion of a "worst case" scenario where detailed site-specific information is not available is required under Council on Environmental Quality (CEQ) regulations originating from the National Environmental Policy Act (NEPA).

Coal

The "worst case" would involve leasing and mining of all areas acceptable for further consideration under each alternative (Table 2-24). It is obvious this has little chance of occurring. Such demand for coal does not exist. Current contracted coal production of 30 million tons per year is 3-5% of the national coal production of 829 million tons in 1982. Map 2-2 shows locations of current and proposed coal mines and transportation corridors. Industry projections (Montana Coal Council) only estimate a production of 47.5 million tons per year by 1990, and a large percentage of this amount would come from private coal. At a 50 million ton per year rate, and assuming all the coal mined is federally owned, Alternatives A, B, C, D and the Preferred Alternative could supply coal for 225, 1,306, 1,397, 64, and 1,306 years, respectively, before supplies were exhausted. The actual numbers would vary because much of the coal mined is privately owned, coal mines may not mine up to the 500-foot depth calculated for coal with development potential, and additional areas suitable pending further study may be found unsuitable after inventory, among other factors. In any case, the time scenario is beyond the time frame of the RMP. The maximum amount of coal that could be mined per year would be limited well below the level of coal reserves available by legislation designed to protect the environment. For example, development would push air quality deterioration to the maximum allowable limits long before the maximum possible amount of coal per year could be mined.

Coal Analysis Background

There are several reasons why such a large area (about a million acres) was analyzed, screened, and cleared for further leasing consideration and is discussed in Alternatives B, C and the Preferred Alternative.

Coal reserves in the Resource Area are vast. Because coal was identified as an issue in the RMP, regulations governing comprehensive land use planning [43 CFR 3420, 1610.7, 1610.4-4(h)] require unsuitability, surface owner, and multiple use screens to be applied to federal lands with known coal potential.

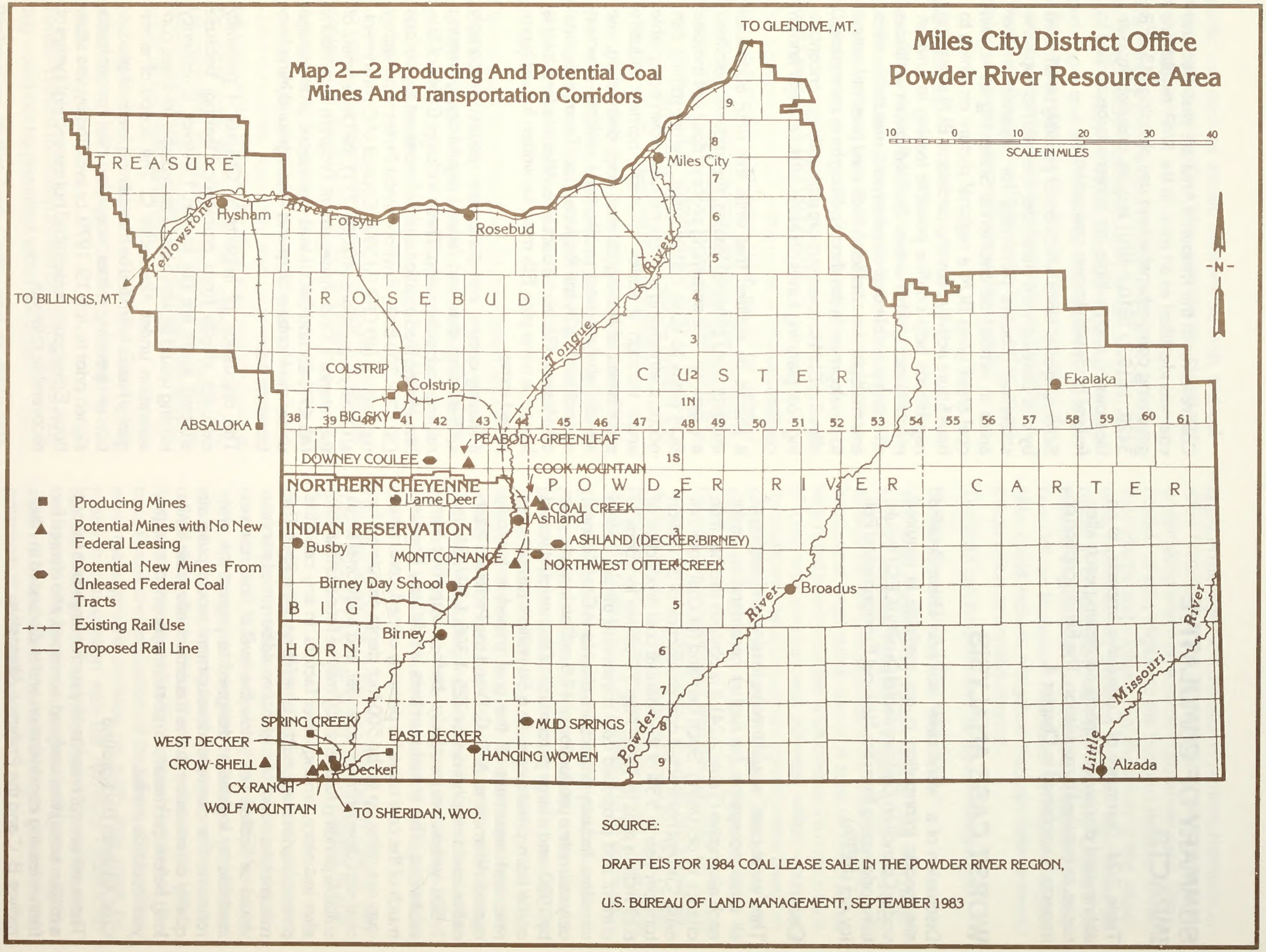
Screening of all lands which could possibly be affected by coal development minimizes the need to apply the screening process piecemeal for separate smaller areas in various amendments. Screening all known coal areas gives BLM a regional picture on which to base future activity planning decisions. BLM screening regulations help confine possible leasing to environmentally acceptable areas. Surface owner attitudes affecting possible coal development, unsuitable areas and multiple use conflicts which may present barriers to development in the short and long term are analyzed, allowing BLM to operate more efficiently by concentrating coal planning funds on areas without major known conflicts.

It should be realized that while this RMP addresses impacts from potential leasing, the impacts described are general. The screening process does not indicate BLM plans to lease certain areas. Before mining can occur, a winnowing process narrows down acceptable areas through a series of steps, namely: industry expressions of leasing interest, tract delineation, site specific analysis/tract profile, tract ranking, selection and scheduling by the Regional Coal Team, a regional coal leasing EIS, and a tract sale. After a federal tract is leased, a mine plan EIS must be written for each proposed mine.

If mining occurs, companies are required to comply with existing state and federal regulations governing mining and reclamation. These include: Office of Surface Mining Reclamation and Enforcement regulations (30 CFR 700-899), Environmental Protection Agency regulations (40 CFR 0-1399), Council of Environmental Quality regulations (40 CFR 211), the Department of the Interior's Coal Management Program regulations (43 CFR 23 and 3400) and regulations promulgated under the Montana Strip and Underground Mine Reclamation Act.

The discussion of impacts in Chapter 4 generally excludes effects from emergency leasing, because affected areas are not known. However, emergency leasing would lie within areas acceptable for lease consideration under Alternative C. The scope of emergency leases is limited to maintaining levels of production at operating mines, supplying coal for contracts signed prior to July 19, 1979, or avoiding bypass situations. Emergency leases shall not exceed eight years of recoverable reserves.

Map 2—2 Producing And Potential Coal Mines And Transportation Corridors



SOURCE:

DRAFT EIS FOR 1984 COAL LEASE SALE IN THE POWDER RIVER REGION,

U.S. BUREAU OF LAND MANAGEMENT, SEPTEMBER 1983

Current mining disturbs about 600 public and private acres per year. Forecasts indicate probable disturbance of up to 1,000 acres per year by the early 1990's. This figure is only 0.01% (one ten-thousandth) of the total 8.25 million surface acres in the Resource Area. Disturbance only refers to areas actually mined, and does not include associated impacts on the surface such as from haul roads and loading facilities.

For areas of new planning in Alternative B, C, and the Preferred Alternative, cultural site estimates were computed by finding the mean cultural resource site density from 11 intensive inventories which sampled most coal deposits. The mean density is one site per 216 acres. The range of sites estimated allows 50% on either side of the mean.

Because federal coal is a subsurface resource, both public and private range lands are impacted. Public owned surface overlays 15% of the federal coal development potential. The AUM figure for estimated coal impacted range in each alternative is based on an estimate of five acres per AUM, derived from range surveys on public surface. Actual surveys on private land have not been done nor are they appropriate at this stage of planning. If and when tracts are actually delineated, more precise range information can be collected for the lands in each tract and the number of AUMs at risk can be calculated more accurately.

Agricultural resource value analysis data were based on assumptions that information collected from 1974-81 Montana Agricultural Statistics from individual County Conservation District long range programs, published by the Soil Conservation Service, and from Resource Area realty specialists was correct. Crop yields were determined by averaging eight years of data from 1974 through 1981.

For recreation analysis, areas with scenic value are based on Visual Resource Management Class 1 or 2 status.

Methods used to derive impacts to hydrology are found in Appendix I.

As a result of the soils analysis, it was determined that 12% of the lands overlying federal coal with development potential are in land capability Classes VII and VIII. It was then assumed that 12% of the lands in the previously planned areas and existing coal leases were also class VII and VIII. This allowed an estimation to be made as to the amount of land with questionable reclaimability.

Projections of employment, population, community services, and fiscal impacts have been produced using the BLM Casper District Office input-output model. The model forecast assumed all coal would be mined and all mines would be in production by approximately 1990 (maximum capacity). These figures and projections should not be used for exact planning by community leaders and planners. These projections are presented to show the possible magnitude of impacts that could happen if all of the coal is mined.

If industry does not develop these mines in the time frame that was used for the model, the figures will change. Community leaders and planners should use these projections to develop possible long range plans. When industry submits an EIS for permitting, more accurate timing, numbers, and impacts can be determined. Mitigating efforts with the mine company should be attempted at that time to help overcome these impacts.

Vegetation Utilization

The "worst case" would involve the mechanical treatment of all identified lands (Table 2-24), based on soil productivity classification, which could be upgraded to good or excellent condition. Total mechanically treatable lands are shown in each alternative but the actual amount of land that will ever be treated is subject to funding constraints and therefore unknown. Before a tract is proposed for mechanical treatment, other means to upgrade the land will have first been attempted. After a tract is proposed for mechanical treatment, a site specific analysis would be proposed as part of an activity plan. Only after other resource conflicts are mitigated or others are determined to not be in conflict, would mechanical treatment occur. Because the actual amount of land to be mechanically treated is unknown, the "worst case" analysis is used.

Lands

The "worst case" would involve the selling or exchanging of all lands in the disposal category, as displayed in the Preferred Alternative as well as in Alternatives B, C, and D. The lands program is a tiered process. The RMP provides alternatives to provide guidance for activity planning which will follow. Although all lands in the disposal category meet the basic disposal criteria, a site specific analysis of tracts, as they are identified for exchange or sale, may result in changes in categorization to some extent. In subsequent activity planning a land report must be prepared to assess the value of resources such as minerals, cultural resources, and endangered species, which is not known in sufficient detail at this time. Only when the value of disposal is shown to be more than the value of a tract's resources is it cleared for disposal. Because the actual amount of disposable land that is categorized for exchange or sale under each alternative is unknown, the "worst case" is used.

TABLE 2-24 SUMMARY OF THE CUMULATIVE IMPACTS

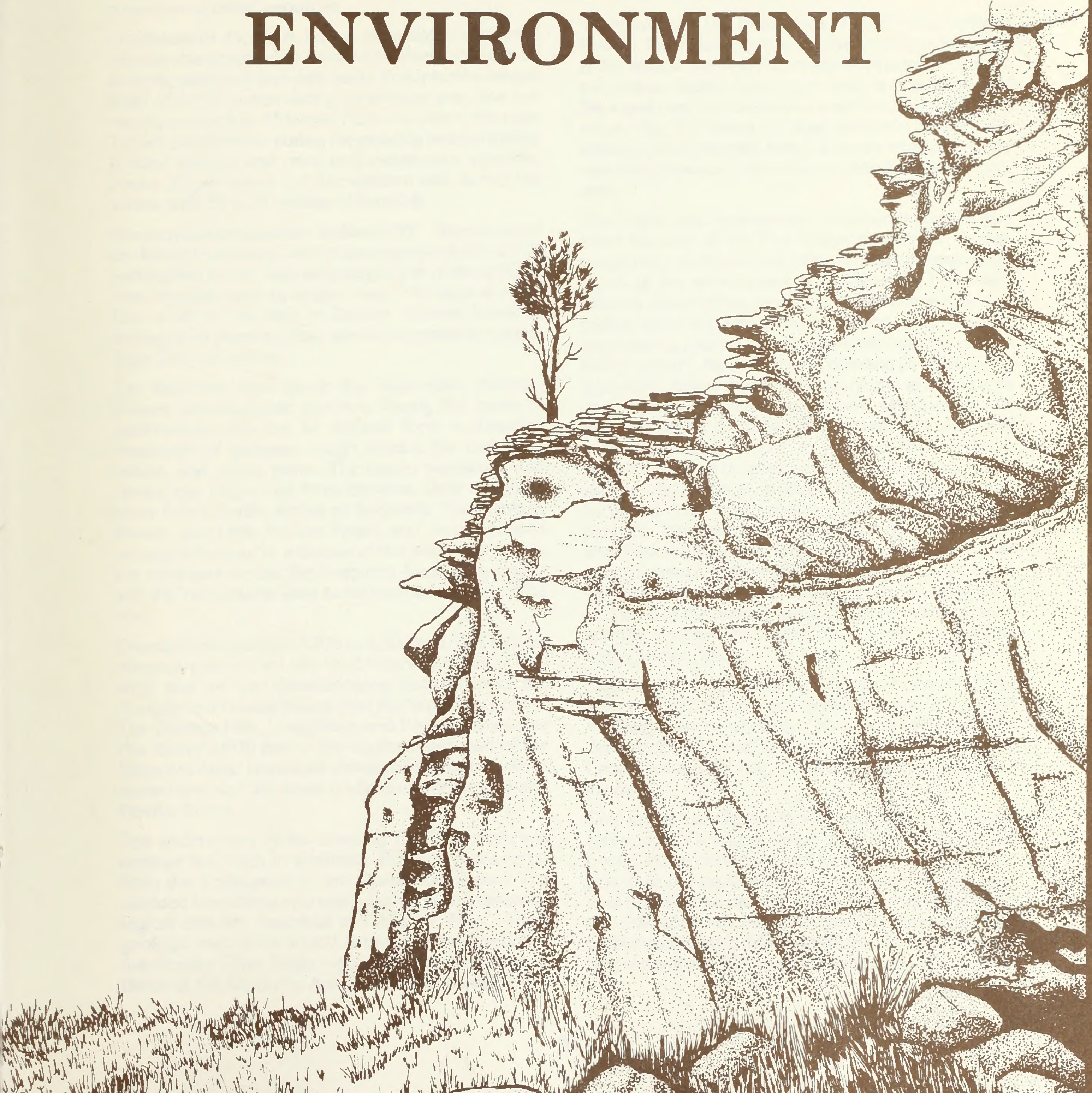
ISSUE	PREFERRED ALTERNATIVE	ALTERNATIVE A
COAL	If all 993,591 acres were mined 65.18 billion tons of the coal resource would be irreversibly and irretrievably lost. There would be insignificant impacts to other minerals. There would be a loss of 198,700 livestock AUMs during mining and reclamation activities with no loss of AUMs after reclamation. After mining and reclamation, sediment and water yields would be reduced by 626 and 29,974 ac ft/yr respectively. A general increase of 500 to 2,000 mg/1 TDS can be expected after reclamation from groundwater discharging in nearby springs, seeps and intermittent streams. There would be significant impacts to groundwater in localized areas. Successful reclamation potential is questionable on 120,000 acres of Class VII and VIII lands. There would be a loss of 43,457 ac ft of soil. Coal development of all 993,591 acres would result in significant local impacts to wildlife. Impacts to cultural resources would be minimal. Paleontological resources would realize a loss of common plant and mollusk fossils. Wilderness characteristics at WSAs would be indirectly impacted by offsite mining nearby. There would be no impacts to lands. There would be a loss of 993,591 acres of recreational potential during mining and reclamation activities, but there would be insignificant impacts to hunting after reclamation. A loss of 38,200 acres having scenic and historical values would occur. The air quality impacts would be minimal. There would be a loss of 49,140 acres of forest land. There would be 47,301 acres of agricultural land lost during mining with no impact after reclamation. Additional coal production would necessitate an increase of social services. Because of an increase in employment, population of Big Horn, Powder River and Rosebud Counties would increase by more than 20,500 by 1990. Coal development would dominate the region and agricultural customs and cultures could be replaced by more urban forms. More employment opportunities would be provided for people in the area thus causing a population gain.	If all 131,091 acres were mined 11.26 billion tons of the coal resource would be irreversibly and irretrievably lost. There would be insignificant impacts to other mineral. There would be a loss of 26,200 livestock AUMs during mining and reclamation activities with no loss of AUMs after reclamation. After mining and reclamation, sediment and water yields would be reduced by 53 and 2,530 ac ft/yr respectively. A general increase of 500 to 2,000 mg/1 TDS can be expected after reclamation from groundwater discharging in nearby springs, seeps and intermittent streams. There would be significant impacts to groundwater in localized areas. Successful reclamation potential is questionable on 16,000 acres of Class VII and VIII lands. There would be a loss of 5,658 ac ft of soil. Coal development on all 131,091 acres would result in low to moderate local impacts on wildlife. Impacts to cultural resources would be minimal. Paleontological resources would realize a loss of common plant and mollusk fossils. There would be no impacts on wilderness characteristics at WSAs. There would be no impacts to lands. There would be a loss of 131,091 acres of recreational potential during mining and reclamation activities, insignificant impact to hunting after reclamation. The air quality impacts would be minimal. There would be a loss of 1,860 acres of forest land. There would be 9,538 acres of agricultural land lost during mining with no impact after reclamation. Population of Powder River, Rosebud and Big Horn Counties would increase by 87% due to increased mining. This influx of people will cause significant changes to social structures of the area. A large increase in population would greatly change the known lifestyle of present residents.
VEGETATION UTILIZATION	As a result of vegetation management there would be no impacts to coal or other mineral resources. There would be a 12% increase of AUMs totalling 233,387 for livestock and 700,161 for wildlife and other nonconsumptive uses. Sediment and water yields would be reduced by 359 and 12,247 ac ft/yr respectively. There would be a loss of 198 ac ft of soil from project construction and mechanical treatments. Improved range condition and most developments would result in improved wildlife habitat. Some mechanical treatments could degrade habitat. Cultural resources would benefit from increased ground cover but would have minimal impacts from range improvements. Paleontologic resources would be little affected. There would be no impact on wilderness characteristics at WSAs. Recreational potential generally would increase because of increased wildlife habitat quality. Air quality impacts would be minimal. There would be no impacts to forest lands and agriculture. Total permit value would increase by 12% on those ranches that would be improved to good condition, should the additional 25,304 AUMs be allotted. The social well-being of ranchers could improve because of improved range condition. There would be no irreversible or irretrievable commitment of resources.	As a result of vegetation management there would be no impacts to coal or other mineral resources. There would be no increase of current AUMs totalling 208,083 for livestock and 624,249 for wildlife and other nonconsumptive uses. Sediment and water yields would be reduced by 51 and 2,228 ac ft/yr respectively. There would be a loss of 110 ac ft of soil from project construction and mechanical treatments. Range conditions would adversely impact wildlife habitat. Most development would improve wildlife habitat. Cultural resources would benefit from increased ground cover but would have minimal impacts from range improvements. Paleontologic resources would be little affected. There would be no impact on wilderness characteristics at WSAs and recreational potential generally would increase because of increased wildlife habitat quality. Air quality impacts would be minimal. There would be no impacts to forest lands, recreation, agriculture, economics and social well-being. There would be no irreversible or irretrievable commitment of resources.
LANDS	As a result of lands actions impacts on coal resources would be small. There would be significant impacts on other mineral resources. There would be a loss of 8,237 livestock AUMs from sales. The loss of AUMs from exchanges would be offset by similar or greater AUMs being gained. There would be no impacts on hydrology and soils (except if a change of use occurred). The sale of 41,181 acres would impact wildlife habitat because of the loss of public control. Exchanges would have little impact and could even be beneficial because of wildlife habitat gained. The effects on cultural resources would be minimal. However, through some exchanges, lands with greater cultural resource values could be gained. A potential loss of 4,892 acres due to sales and a potential loss of 14,678 acres due to exchanges within the Hell Creek Formation would occur to the paleontological resource if not identified. There would be no impacts on wilderness. There would be an irreversible and irretrievable loss of 41,181 acres of land from sales. Exchanges on 123,542 acres could result in beneficial impacts such as acquiring access to rivers and acquisition of parcels with cultural, historical and paleontological resources, or recreational potential. Recreation potential would be impacted by sales. There would be no impact on air quality. A maximum of 17,686 acres of forest land would be removed from public ownership. There could be a change of use on 51,064 acres of Class III and IV lands suitable for agriculture. Land sales would reduce some of the management costs and eliminate isolated tracts for more economical management.	As a result of lands actions impacts on coal resources would be small. There would be insignificant impacts on other mineral resources. There would be a loss of 128 livestock AUMs from sales. The loss of the few AUMs from exchanges would be offset by similar or greater AUMs being gained. There would be no impacts on hydrology and soils (except if a change of use occurred). The sale of 640 acres would impact wildlife habitat because of the loss of public control. Exchanges would have little impact and could even be beneficial because of wildlife habitat gained. The effects on cultural resources would be minimal. There would be very little impact on paleontological resources. There would be no impacts on wilderness. There would be a irreversible and irretrievable loss of 640 acres of land from sales. Exchanges on 3,840 acres would result in small beneficial impacts. Recreation potential would benefit from exchanges and be impacted by sales. There would be no impact on air quality. A maximum of 1,860 acres of forest land would be removed from public ownership. There could be a change of use on 128 acres of Class III and IV lands suitable for agriculture. Sales and exchanges would eliminate isolated tracts and would lower management costs. Some changes in social well-being can be expected if lands are sold or exchanged to outsiders.
WILDERNESS	There would be no significant short-term impacts from recommending both WSAs as not suitable for wilderness. However, in the long term, wilderness characteristics would be degraded from management which considers other resources.	There would be no significant impacts in the short term from continuing current management at both WSAs. However, in the long term, wilderness characteristics would be slightly degraded.

ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D
If all 993,591 acres were mined 65.18 billion tons of the coal resource would be irreversibly and irretrievably lost. There would be insignificant impacts to other minerals. There would be a loss of 198,700 livestock AUMs during mining and reclamation activities with no loss of AUMs after reclamation. After mining and reclamation, sediment and water yields would be reduced by 574 and 27,462 ac ft/yr respectively. A general increase of 500 to 2,000 mg/1 TDS can be expected after reclamation from groundwater discharging in nearby springs, seeps and intermittent streams. There would be significant impacts to groundwater in localized areas. Successful reclamation potential is questionable on 120,000 acres of Class VII and VIII lands. There would be a loss of 43,457 ac ft of soil. Coal development on all 993,591 acres would result in significant local impacts to wildlife. Impacts to cultural resources would be minimal. Paleontological resources would realize a loss of common plant and mollusk fossils. Wilderness characteristics at WSAs would be indirectly impacted by offsite mining nearby. There would be no impacts to lands. There would be a loss of 993,591 acres of recreational potential during mining and reclamation activities, but insignificant impacts to hunting after reclamation. A loss of 38,200 acres having scenic and historical values would occur. The air quality impacts would be minimal. There would be a loss of 49,140 acres of forest land. There would be 47,301 acres of agricultural land lost during mining with no impact after reclamation. Additional coal production would necessitate an increase of social services. Because of an increase in employment, the population of Big Horn, Powder River and Rosebud Counties would increase by more than 20,500 by 1990. Coal development would dominate the region and agricultural customs and cultures could be replaced by more urban forms. More employment opportunities would be provided for people in the area thus causing a significant population gain.	If all 1,088,291 acres were mined 69.81 billion tons of the coal resource would be irreversibly and irretrievably lost. There would be insignificant impacts to other minerals. There would be a loss of 217,700 livestock AUMs during mining and reclamation activities with no loss of AUMs after reclamation. After mining and reclamation, sediment and water yields would be reduced by 626 and 29,974 ac ft/yr respectively. A general increase of 500 to 2,000 mg/1 TDS can be expected after reclamation from groundwater discharging in nearby springs, seeps and intermittent streams. There would be significant impacts to groundwater in localized areas. Successful reclamation potential is questionable on 130,000 acres of Class VII and VIII lands. There would be a loss of 47,600 ac ft of soil. Coal development on 1,088,291 acres would result in significant local impacts to wildlife. Impacts to cultural resources would be minimal. Paleontological resources would realize a loss of common plant and mollusk fossils. Wilderness characteristics at WSAs would be indirectly impacted by offsite mining nearby. There would be no impacts to lands. There would be a loss of 1,088,291 acres of recreational potential during mining and reclamation activities, but there would be no impact after reclamation. A loss of 61,500 acres having scenic and historical values would occur. Air quality impacts would be minimal. There would be a loss of 70,360 acres of forest land. There would be 50,216 acres of agricultural land lost during mining with no impact after reclamation. Additional coal production would necessitate an increase of social services. Coal development would dominate the region and agricultural customs and cultures could be replaced by more urban forms. There would be significant impacts on Powder River, Big Horn and Rosebud Counties due to the magnitude of population increase.	If all 39,391 acres were mined 3.43 billion tons of the coal resource would be irreversibly and irretrievably lost. There would be insignificant impacts to other minerals. There would be a loss of 7,878 livestock AUMs during mining and reclamation activities with no loss of AUMs after reclamation. After mining and reclamation, sediment and water yields would be reduced by 23 and 1,096 ac ft/yr respectively. A general increase of 500 to 2,000 mg/1 TDS can be expected after reclamation from groundwater discharging in nearby springs, seeps and intermittent streams. There would be significant impacts to groundwater in localized areas. Successful reclamation potential is questionable on 5,000 acres of land capability Class VII and VIII lands. There would be a loss of 1,723 ac ft of soil. Coal development on 39,391 acres would have little local impact on wildlife. Impacts to cultural resources would be minimal. Paleontological resources would realize a loss of common plant and mollusk fossils. There would be no impact on wilderness characteristics at WSAs. There would be no impacts to lands. There would be a loss of 39,391 acres of recreational potential during mining and reclamation activities. The air quality impacts would be minimal. There would be a loss of 240 acres of forest land. There would be 1,020 acres of agricultural land lost during mining. Additional coal production would necessitate an increase of social services due to an increase in employment. Big Horn, Powder River and Rosebud Counties would increase in population by 10,800 people by 1990. Social impacts would greatly change due to increased population and would change the lifestyle of present residents.
As a result of vegetation management there would be no impacts to coal or other mineral resources. There would be a 12% increase of AUMs totalling 233,387 for livestock and 700,161 for wildlife and other non-consumptive uses. Sediment and water yields would be reduced by 359 and 12,247 ac ft/yr respectively. There would be a loss of 198 ac ft of soil from project construction and mechanical treatments. Improved range condition and most developoments would result in improved wildlife habitat. Some mechanical treatments could degrade wildlife habitat. Cultural resources would benefit from increased ground cover but would have minimal impacts from range improvements. Paleontologic resources would be little affected. There would be no impact on wilderness characteristics at WSAs. Recreational potential generally would increase because of increased wildlife habitat quality. Air quality impacts would be minimal. There would be no impacts to forest lands and agriculture. Total permit value would increase by 12% on those ranches that would be improved to good condition, should the additional 25,304 AUMs be allotted. The social well-being of ranchers could improve because of improved range condition. There would be no irreversible or irretrievable commitment of resources.	As a result of vegetation management there would be no impacts to coal or other mineral resources. There would be a 53% increase of AUMs totalling 319,269 for livestock and 957,798 for wildlife and other nonconsumptive uses. Sediment and water yields would be reduced by 2,361 and 72,434 ac ft/yr respectively. There would be a loss of 780 ac ft of soil from project construction and mechanical treatments. Range conditions and developments limiting vegetation types and diversity would substantially impact wildlife habitat. Livestock grazing use and habitat changes would significantly impact wildlife. Cultural resources would benefit from increased ground cover but would have minimal impacts from range improvements. Paleontologic resources would be little affected. There would be no impact on wilderness characteristics at WSAs. Recreational potential would generally increase from 700 additional water improvements, but decrease to less wildlife habitat quality. Air quality impacts would be minimal. There would be no impacts to forest lands and agriculture. Permit values would increase by 53% providing for greater loan value to ranchers and would increase the value of ranches, if sold. The social well-being of ranchers could improve because of improved range condition. There would be no irreversible or irretrievable commitment of resources.	As a result of vegetation management there would be no impacts to coal or other minerals. There would be a 15% decrease of AUMs to 177,491 for livestock and increase to 701,727 for wildlife and other nonconsumptive uses. Sediment and water yields would be reduced by 367 and 12,458 ac ft/yr respectively. There would be a loss of 197 ac ft of soil from project construction and mechanical treatments. Increased wildlife AUMs would be very beneficial for wildlife. Range conditions, developments and mechanical treatments would benefit wildlife habitat. Cultural resources would benefit from increased ground cover but would have minimal impacts from range improvements. Paleontologic resources would be little affected. There would be no impact on wilderness characteristics at WSAs and recreational potential generally would increase because of increased wildlife habitat quality. Air quality impacts would be minimal. There would be no impacts to forest lands and agriculture. A cut in the authorized AUMs would cause a $1,020,000 per year loss to ranchers in the short term. In the long term, production would increase by $1.8 million dollars. Short-term impacts to ranchers would be great; however, long-term impacts could improve the social well-being of ranchers. There would be no irreversible or irretrievable commitment of resources.
As a result of lands actions impacts on coal resources would be small. There would be significant impacts on other mineral resources. There would be a loss of 16,473 livestock AUMs from sales. The loss of AUMs from exchanges would be offset by similar or greater AUMs being gained. There would be no impacts on hydrology and soils (except if a change of use occurred). The sale of 82,362 acres would impact wildlife habitat because of the loss of public control. Exchanges would have little impact and could even be beneficial because of wildlife habitat gained. The effects on cultural resources would be minimal. However, through some exchanges, lands with greater cultural resource values could be gained. A potential loss of 9,785 acres due to sales and a potential loss of 9,785 acres due to exchanges within the Hell Creek Formation would occur to the paleontological resource if not identified. There would be no impacts on wilderness. There would be an irreversible and irretrievable loss of 82,362 acres of land from sales. Exchanges on 82,361 acres could result in beneficial impacts such as acquiring access to rivers and large tracts and acquisition of parcels with cultural, historical and paleontological resources, or recreational potential. Recreation potential would be impacted by sales. There would be no impact on air quality. A maximum of 17,686 acres of forest land would be removed from public ownership. There could be a change of use on 51,064 acres of Class III and IV lands suitable for agriculture. Land sales would reduce some of BLM's management costs and eliminate isolated tracts for more economical management.	As a result of land actions impacts on coal resources would be small. There would be significant impacts on other mineral resources. There would be a loss of 24,709 livestock AUMs from sales. The loss of the few AUMs from exchanges would be offset by similar or greater AUMs being gained. There would be no impacts on hydrology and soils (except if a change of use occurred). The sale of 123,542 acres would largely impact wildlife habitat because of the loss of public control. Exchanges would have little impact and could even be beneficial because of wildlife habitat gained. The effects on cultural resources would be minimal. However, through some exchanges, lands with greater cultural resource values could be gained. A potential loss of 14,678 acres due to sales and a potential loss of 4,892 acres due to exchanges within the Hell Creek formation would occur to the paleontological resource if not identified. There would be no impacts on wilderness. There would be a irreversible and irretrievable loss of 123,542 acres of land from sales. Exchanges on 41,181 acres could result in beneficial impacts such as acquiring access to rivers and large tracts and acquisition of parcels with cultural, historical and paleontological resources, or recreational potential. Recreation potential would be impacted by sales. There would be no impact on air quality. A maximum of 17,686 acres of forest land would be removed from public ownership. There could be a change of use on 51,064 acres of Class III and IV lands suitable for agriculture. There would be a decrease in BLM management costs due to the deletion of isolated tracts and the U.S. Treasury would realize an increase of $12,379,050, in the long term, by the sale of 75% of the land under consideration. Sales and exchanges may have a negative impact to the rancher if the lessee cannot afford to buy the adjacent land or if the land is exchanged to someone else.	As a result of lands actions impacts on coal resources would be small. There would be significant impacts on other mineral resources. There would be a loss of 8,237 livestock AUMs from sales. The loss of AUMs from exchanges would be offset by similar or greater AUMs being gained. There would be no impacts on hydrology and soils (except if a change of use occurred). The sale of 41,181 acres would impact wildlife habitat because of the loss of public control. Exchanges would have little impact and could even be beneficial because of wildlife habitat gained. The effects on cultural resources would be minimal. However, through some exchanges, lands with greater cultural resource values could be gained. A potential loss of 4,892 acres due to sales and a potential loss of 14,678 acres due to exchanges within the Hell Creek formation would occur to the paleontological resource if not identified. There would be no impacts on wilderness. There would be a irreversible and irretrievable loss of 41,181 acres of land from sales. Exchanges on 123,542 acres could result in beneficial impacts such as acquiring access to rivers and large tracts and acquisition of parcels with cultural, historical and paleontological resources, or recreational potential. Recreation potential would benefit from exchanges and be impacted by sales. There would be no impact on air quality. A maximum of 17,686 acres of forest land would be removed from public ownership. There could be a change of use on 51,064 acres of Class III and IV lands suitable for agriculture. BLM would reduce costs for management by blocking up lands. There is the potential that if land adjacent to current lessees is exchanged to someone else, it may harm the lessee's ranching operation.
There would be no significant short or long-term environmental impacts from wilderness designation of Zook Creek; however, wilderness characteristics would be preserved. There would be minimal economic impacts from wilderness management. Current commitments could restrict wilderness manageability. There would be no significant impacts in the short term from managing Buffalo Creek with the consideration of other resources in the short term. However, in the long term, wilderness characteristics would be degraded.	There would be no significant short-term impacts from recommending both WSAs as not suitable for wilderness. However, in the long term, wilderness characteristics would be degraded from management which considers other resources.	There would be no significant short or long-term environmental impacts from wilderness designation of both Zook Creek and Buffalo Creek; however, wilderness characteristics at both areas would be preserved in the long term. There would be minimal economic impacts from wilderness management at both areas. Current commitments could restrict wilderness manageability.

ISSUE
COAL
VEGETATION UTILIZATION
LANDS
WILDERNESS

CHAPTER 3

AFFECTED ENVIRONMENT



INTRODUCTION

This chapter provides a discussion, by resource, of the environment affected by the individual proposals under the various alternatives in this RMP. This information is summarized from the Management Situation Analysis (MSA) on file at the BLM Miles City District Office. Detailed base maps and overlays have been compiled for the coal and vegetation utilization issues along with a number of other resources.

Southeastern Montana has a semi-arid, continental climate characterized by extreme weather variations on a yearly, seasonal, and daily basis. Precipitation ranges from 10 to 19 inches during an average year, but can vary by as much as 15 inches from one year to the next. Timely precipitation during the growing season makes dryland farming and mine land reclamation possible. About 20 percent of the precipitation falls during the winter, with 30 to 50 inches of snowfall.

Mean annual temperature is about 45°F. Temperatures are lowest in January, with an average low of about 8°F, and highest in July, with an average high of about 90°F. The frost-free season ranges from 158 days at Miles City to 90 to 100 days at Decker. Relative humidity averages 60 percent. Mean annual evaporation ranges from 35 to 45 inches.

The Resource Area lies in the unglaciated Missouri Plateau physiographic province. Nearly flat layers of sedimentary rock cut by streams form a dissected landscape of plateaus, rough breaks, flat bottomed valleys, and rolling plains. The harder sandstone and clinker cap ridges and form benches while the softer shale forms gentle slopes or badlands. The Tongue, Powder and Little Powder Rivers, and lesser streams occupy valleys up to a thousand feet deep and flow to the northeast across the Resource Area. They empty into the Yellowstone River at the northern border of the area.

Elevations range from 2,200 to 4,800 feet. The highest elevations are in the Little Wolf Mountains west of Colstrip, and on the plateaus along both sides of the Tongue and Powder Rivers near the Wyoming border. The Ekalaka Hills, Long Pines and Finger Buttes also rise above 4,000 feet in the southeastern part of the Resource Area. The lowest elevations follow the Yellowstone River and the lower reaches of the Tongue and Powder Rivers.

The sedimentary rocks covering the Resource Area average two miles in thickness. Exposed rocks range from the Cretaceous to the Quaternary Period. The exposed formations and related mineral and paleontological data are described in Table 3-1. Map 3-1 is a geologic map of the area. A broad structural trough—the Powder River Basin—occupies the western two-thirds of the Resource Area. The basin contains vast coal and substantial oil and gas reserves. The Black Hills Uplift dominates the southeastern corner of the Resource Area, and the Sumatra Anticline the northwestern corner.

COAL

Setting

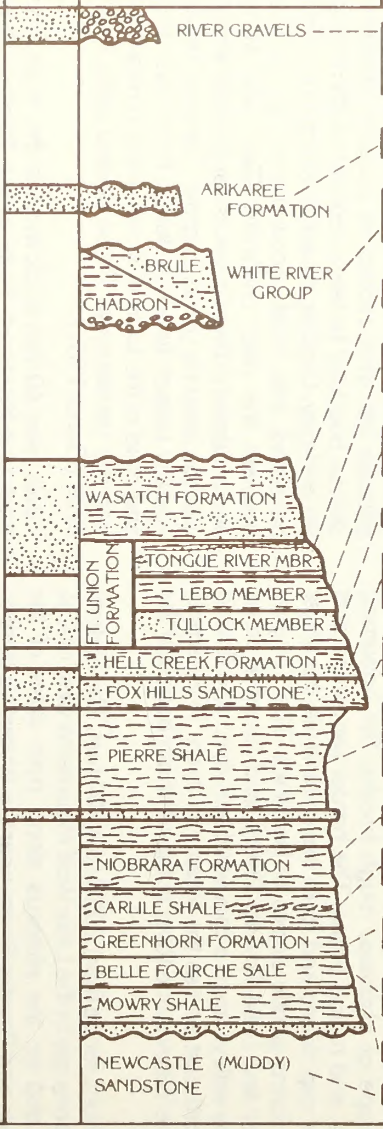
There are over 100 billion tons of coal in the northern Powder River Basin, providing the Resource Area one of the largest coal reserves of any BLM resource area in the United States. Major coal beds are up to 85 feet thick and may be continuous over hundreds of square miles. Map 3-2 shows the area underlain by coal with development potential. Map 2-2 shows locations of current and proposed coal mines and transportation corridors.

The major coal reserves are contained in the Tongue River Member of the Fort Union Formation. The arrangement of these coal beds is best understood in terms of the environment at the time the beds were formed. Sixty million years ago in Paleocene time, the region was a large complex of swamps and sluggish, meandering rivers similar to the present-day Mississippi River system. Ancient rivers, heading in uplands in Wyoming, flowed northeast through the low-lying area which is now southeastern Montana, where sediments were deposited in fluvial (river-related) settings. River courses left their record as massive channel sandstones, bounded by levee deposits of alternating sand, silt and clay. Organic material, which compacted and hardened into coal, accumulated in backswamps between the river channels. Clays and limestones accumulated in lakes in backswamp areas where water was too deep for plants to grow. The river would occasionally breach its levee during floods, sending sand and mud in the form of small deltas (crevasse splays) into the backswamp. These caused splits in the coal beds (Flores 1981).

Coals over 40 feet thick include the Anderson-Dietz, Wall and Knobloch beds in the Decker, Kirby, and Ashland areas, respectively. Other coals with significant deposits in excess of 20 feet thick include the Canyon, Cook, Pawnee, Sawyer, Rosebud, Broadus, and Dominy beds.

Coal varies from lignite to subbituminous in rank. As-received BTU values range from under 7,000 per pound in the north and east to as much as 9,900 per pound in the southwestern corner near Decker. The coal typically has low ash (4% to 10%) and sulfur (0.1% to 1.2%) contents. Moisture content varies from 20% (subbituminous) to 34% (lignite), and fixed carbon content varies from 38% (subbituminous) to 31% (lignite).

TABLE 3-1. GENERALIZED STRATIGRAPHIC COLUMN OF FORMATIONS EXPOSED IN POWDER RIVER RESOURCE AREA



PERIOD	EPOCH	AGE Mls. Yrs.	WATER POTENTIAL	FORMATION	LITHOLOGY	THICKNESS (ft) where not eroded	MINERAL RESOURCES	TYPICAL FOSSILS
QUATERNARY	PLEISTOCENE PLIOCENE	2 8	▨	RIVER GRAVELS	well rounded gravels of igneous and metamorphic rocks, subangular clasts of clinker and sandstone, in a sand to clay matrix. Forms terraces of loose material, and fills river valleys as alluvium	up to 110	sand, gravel, agates	mammoth camel petrified wood
TERTIARY	MIOCENE	12 16	▨	ARIKAREE FORMATION	massive greenish-white to light gray tuffaceous sandstone and siltstone; thin interbeds of volcanic ash and chert	up to 385	uranium	oreodonts seeds
	OLIGOCENE	20 24		WHITE RIVER GROUP (BRULE, CHADRON)	Brule: orange to brown tuffaceous sandstone and siltstone—Chadron: dark to light gray tuffaceous shale, siltstone and sandstone with conglomerate and limestone	up to 100	uranium	oreodonts turtles seeds
	EOCENE	28 32	▨	WASATCH FORMATION	gray to brown to yellow sandstone and interbedded gray shale, coal, some clinker	up to 500	coal	Hyracotherium fern snails
	PALEOCENE	36 40		FT. UNION FORMATION: TONGUE RIVER MBR	yellow sandstone, tan to gray siltstone and shale, many thick coal beds, thin limestone lenses; red clinker common where coal beds have burned	up to 2400	vast coal reserves clinker	clams Metasequoia petrified wood
		44 48		FT. UNION FORMATION: LEBO MEMBER	dark shale and claystone, carb. shale, yellow sandstone, ironstone concretions, thin coals; swelling clays common; forms badlands	100-500	coal	katsura tree mammals snails turtles
		52	▨	FT. UNION FORMATION: TULLOCK MEMBER	yellow sandstone, gray shale and siltstone, thin coals	200-800	coal	gar champsosaurs
CRETACEOUS		56 60		HELL CREEK FORMATION	Upper part: greenish gray to olive brown shale and siltstone forms badlands—Lower part: massive cliff-forming yellow-brown sandstone, and olive brown shale	100-500 (upper Hell Cr. aquitard)		dinosaurs small mammals Metasequoia
		64 68	▨	FOX HILLS SANDSTONE	Upper part: massive light gray fine sandstone (Colgate Member)—Lower part: brownish gray sandstone to shale	300-750 (Fox Hills & lower Hell Cr. aquifer)		Ophiomorpha
		72 76		PIERRE SHALE	dark gray shale forming featureless plains, limestone concretions, bentonite; lt. gray shale, siderite, and glauconitic sandstone in Gammon Member; in Treasure Co., upper Pierre called Bearpaw Shale; Judith River Formation and Eagle Sandstone may occur within Pierre	1700-2000	natural gas bentonite	ammonites baculites Inoceramus clams
		80		NIOBRARA FORMATION	marl and calcareous shale	200		clams
		84 88		CARLILE SHALE	dark gray shale, ferruginous and limestone concretions, light gray sandstone, bentonite	600	bentonite	
		92 96		GREENHORN FORMATION	gray calcareous shale and marl, limestone, gray noncalcareous shale	50-350		clams oysters
		100		BELLE FOURCHE SALE	dark gray to black shale with limestone and siderite concretions and bentonite	500-850	bentonite	
		104		MOWRY SHALE	dark gray siliceous shale with many bentonite beds	230	bentonite	fish scales
		108		NEWCASTLE (MUDDY) SANDSTONE	light gray sandstone, siltstone, and dark gray shale	20-60	Oil is in Muddy Ss. and older formations such as Red River	

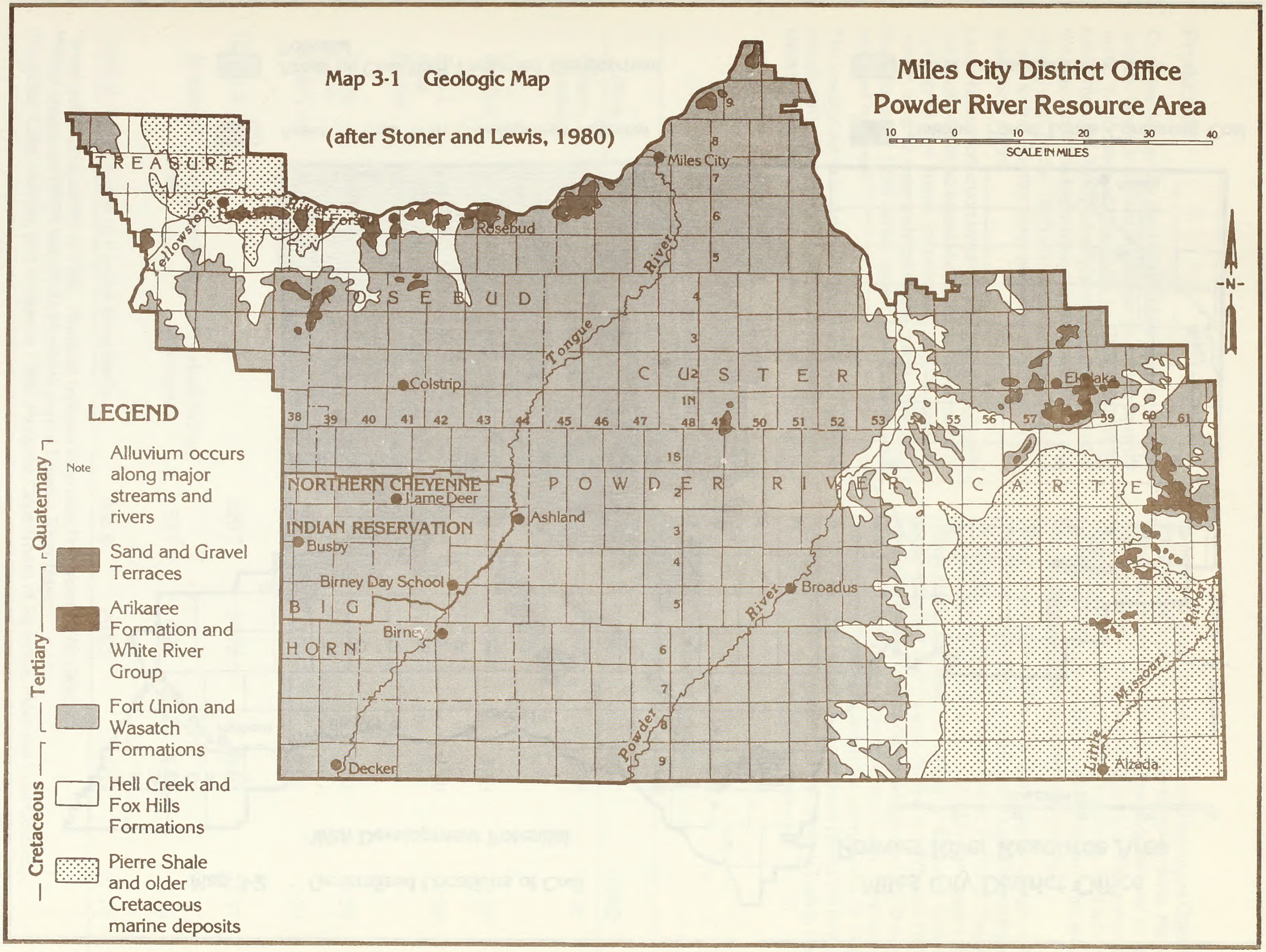
Note: Formation column shown as a function of time, not thickness

▨ Denotes aquifer

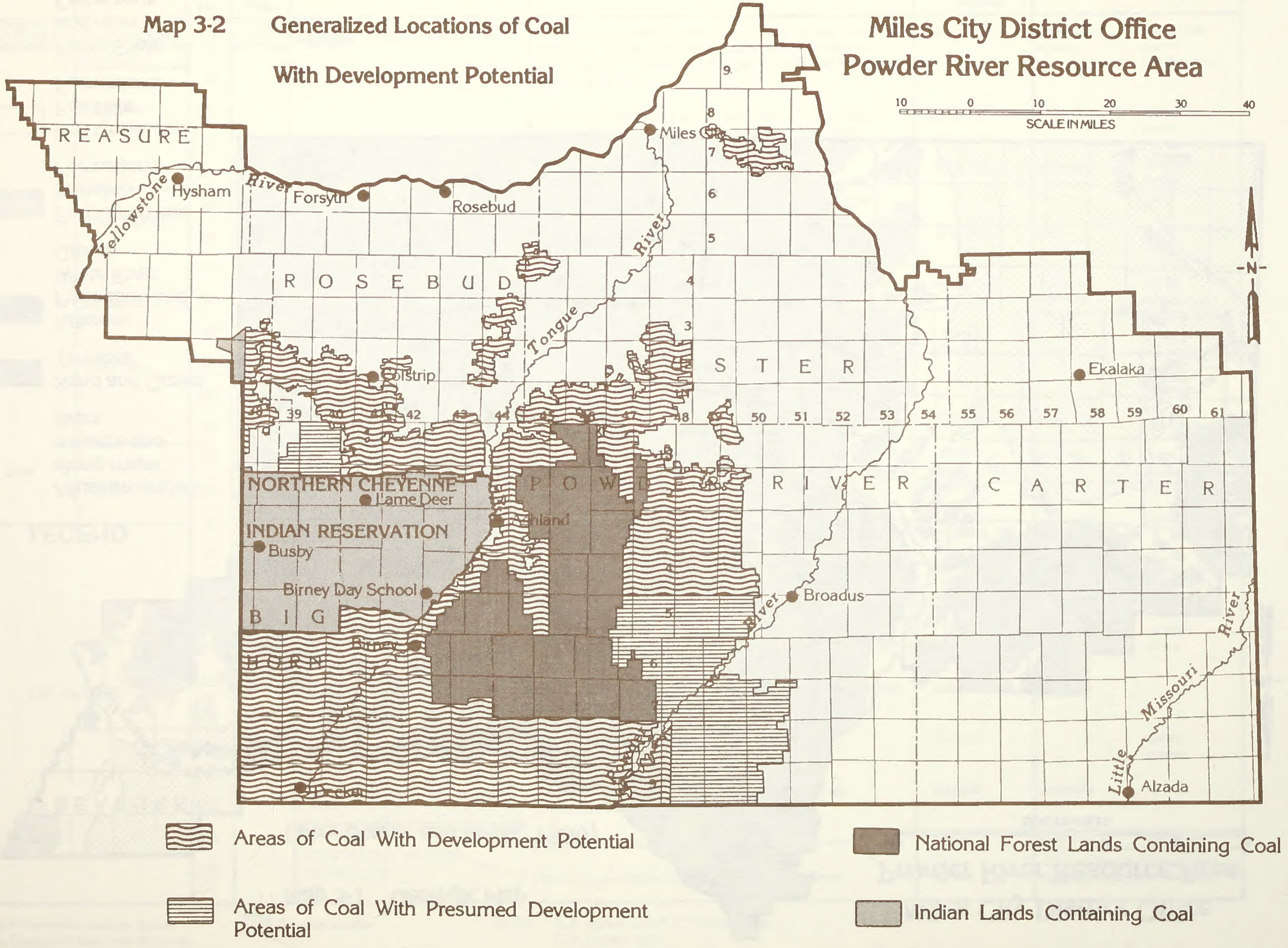
AFTER:
A. F. Agnew and P. C. Tychson 1965
C. A. Balster 1971
R. A. Schoon 1974
R. N. Bergantino 1980
B. D. Lewis and W. R. Hotchkiss 1981

Map 3-1 Geologic Map

(after Stoner and Lewis, 1980)



Map 3-2 Generalized Locations of Coal With Development Potential



Production

Coal was known by the Indian tribes and early white settlers. Lewis and Clark expedition journals frequently noted the location of coal beds. In 1807, Spanish fur trader Manuel Lisa reportedly heated his trading post at the junction of the Bighorn and Yellowstone Rivers with nearby coal. By the 1890's homesteads from Rosebud Creek to the Powder River obtained coal from small-scale local mines.

Large-scale production began in 1923 when the Northern Pacific Railroad established the town and mines of Colstrip to fuel steam locomotives. In 34 years, 44 million tons of coal were produced there. The mine shut down in 1958 when steam locomotives were replaced by diesel.

The resurgence in coal production (Table 3-2) is due to use of coal to fire boilers in large-scale steam-generated electric power plants. This upturn began in 1968 when Western Energy Company resumed mining at Colstrip. Coal was shipped to power plants in Montana, Minnesota and Wisconsin. In 1969, Peabody opened its Big Sky mine a few miles south of Colstrip and exported the coal out-of-state. As with Western Energy, coal is transported by rail north to Burlington Northern lines along the Yellowstone River and then east or west.

On-site conversion of coal to electricity for utilities in the Pacific Northwest (Montana Power, Puget Sound Power and Light, Washington Water Power, Portland General Electric, and Pacific Power and Light) has caused the most recent increase in mining at Colstrip. Colstrip power plants 1 and 2 came on line in 1975 and 1976, respectively. Each plant can produce about 330 megawatts of electricity. Colstrip Units 3 and 4 are under construction and scheduled for completion in 1984 and 1985, respectively. Each of these plants will be able to produce 700 megawatts of electricity (Colstrip Fact Sheet, Western Energy Company).

TABLE 3-2
COAL PRODUCTION IN RESOURCE AREA (MILLION TONS)

Mine	Owner	Coal Beds Mined	Cumulative Through 1982	1980	1981	1982
Colstrip (Rosebud)	Western Energy (Montana Powder Co.)	Rosebud	98.4	10.45	10.35	9.45
Big Sky	Peabody Coal Co.	Rosebud McKay	29.3	2.94	3.19	2.89
East & West Decker	Kiewit Mining & Engineer (50%) Nerco Mining Co. (50%)	Anderson Dietz 1 Dietz 2	29.3	2.94	3.19	2.89
Spring Creek	Nerco Mining Co.	Anderson Dietz	5.9	0.09	4.37	1.36
Coal Creek	Clayton Tonnemaker	Sawyer	0.2*	0.06	0.06	0.02
TOTALS			229.7	24.72	28.60	23.57
Absaloka*	Westmoreland Res.	Rosebud-McKay Robinson	37.1	4.91	4.45	4.16
Totals in Montana Part of Powder River Basin			266.8	29.63	33.05	27.73

*Went out of production in 1982. Number represents production from 1976-1982.
**Mine outside of PRRA but within Montana part of Powder River Basin.
(Sources: Cole, Matson, and Pederson 1980; Montana Department of Revenue; Montana Coal Council).

In the 1970's, coal mines began to open up near Decker, just north of Sheridan, Wyoming. West Decker mine opened in 1972, and East Decker began operation in 1978. Spring Creek mine started operation in 1980. Coal is shipped from these mines by rail to Sheridan and then east or south to out-of-state utilities. Decker area coal averages 1,000 BTU per pound higher in heat values than Colstrip area coal. Coal seams are also much thicker there than at Colstrip (50-80 feet versus 25 feet; Cole, Matson, and Pederson 1980).

Mines in the Resource Area produced 23.6 million tons of coal in 1982, or 85% of the state's total production of 27.9 million tons (Table 3-2). The 1982 output was during a recession. Production can be expected to increase by a few million tons per year due to the recovering economy.

The Federal Coal Program

Prior to 1971, federal coal in the Resource Area was leased in response to industry applications on a case-by-case basis. A coal lease moratorium in 1971 and legislation requiring land use planning prior to leasing limited leasing during the 1970's to emergency leases for maintaining production or avoiding bypass. The Management Framework Plans (MFPs) for the coal-bearing Decker-Birney, Coalwood and South Rosebud Planning Units were updated to satisfy the new land use planning requirements. As a result, an MFP update for federal coal in five areas near Colstrip, Ashland, and Decker was issued in July 1979. Lease tracts were delineated within these areas in 1981 and a coal sale was held in April 1982.

Another MFP amendment was completed in June 1980 covering 15 coal areas not considered in the 1979 update. This amendment was withdrawn by the BLM Director.

Legislation cancelling coal leases and permits on the Northern Cheyenne Indian Reservation and allowing companies to be compensated by exchanging for non-competitive leases on federal lands elsewhere was enacted in 1980 (P.L. 96-401). This, as well as the Rattlesnake Wilderness Area Exchange Legislation (P.L. 96-476) and the BLM Director's instructions to re-examine certain coal areas in the 1980 amendment for possible leasing needs, resulted in the publication of an MFP amendment for six coal areas in May 1982. Site specific analysis of delineated tracts was completed in March 1983 for the Colstrip, Greenleaf-Miller, Decker, Squirrel Creek, Hanging Woman, and Moorhead coal areas. Some of the tracts not bid on during the 1982 sale in the Ashland-Otter Creek and Decker areas may also be re-offered in the future.

The 22 current federal coal leases in the Resource Area cover 39,391 acres. As of fiscal year 1982, cumulative production from operating leases was 115.9 million tons of coal, or 50% of the cumulative coal production in the Resource Area. There is one current coal license for local use. There are no preference right lease applications.

The Office of Surface Mining has delegated to the State of Montana the responsibility for ensuring that coal land mining and reclamation standards are followed. Where federal surface is affected, BLM reviews and comments, in a support role, on proposed actions, to help ensure protection of the surface estate. BLM also issues coal exploration licenses as outlined in 43CFR 3410 and is responsible for releasing reclamation bond on drill holes. An average of four exploration licenses are issued per year in the Resource Area. The mine operations and resource evaluation functions of the Minerals Management Service were transferred to BLM during 1983. BLM also has the responsibility for post-lease monitoring and inspection of coal reserves in mine areas.

Trends

The growth in coal demand, regionally and nationally, is tied closely to the growth in demand for electricity. The National Coal Association (1982) predicts steady growth through 1995 but at a reduced rate from the 1970s. Projections for 1990 coal production in the Powder River Basin (Wyoming and Montana) range from 163 million to 412 million tons per year (Office of Technology Assessment 1981; U.S. Department of Energy 1980). The high projections assume a large increase in synfuels production, which during 1983 appeared unlikely. The Montana portion of 1990 production is expected to be about 48 million tons per year (Montana Coal Council 1980). Projected 1990 mine capacity is shown in Table 3-3.

Large-scale coal development within the next few years appears restricted to the Colstrip, Decker and possibly Ashland areas. Coal will be used primarily to fuel steam-generated power plants. On-site conversion will apparently be limited to Colstrip and coal will be exported from other mines.

During 1983, mines in the Decker area were operating at half capacity due to the slow market. There is much competition between existing mines in the region for coal contracts. Planned projects, such as Consolidation Coal Company's CX Ranch project near Decker, and the Montco mine near Ashland, did not have buyers as of November 1983. Contract problems between the Spring Creek mine and its Texas utility customer reduced full-scale production there from 7 million to between one and two million tons per year. If markets become favorable, new production is possible by 1992 at both Consol's CX Ranch and Peter Kiewit and Sons' Wolf Mountain proposed mine areas near Decker. Montana Power Company's new power generation Units 3 and 4 will require mining an additional 5.5 million tons per year over current production at the Colstrip mine.

The proposed Tongue River Railroad, which was in the permitting stage during 1983 with the Interstate Commerce Commission, will be a large factor in future growth of coal mining in the Ashland area. If approved and constructed, the railroad would provide a transportation corridor for several proposed mines, including Montco in the Tongue River Valley and federal tracts in the Cook Mountain, Ashland, and Otter Creek areas.

In the longer term, additional development could occur on federal lease tracts in the Ashland, Hanging Woman, Moorhead and Greenleaf-Miller areas. Leasing of federal coal could also make projects such as the Dominy mine proposal in the Pine Hills near Miles City more likely.

Montana coal has not been in demand for export overseas due to low BTU ratings and high transportation costs. Coals with higher BTU ratings from Utah, Colorado and Wyoming will likely continue to dominate the export market.

New federal coal production would tend to be stimulated by factors such as: economic recovery; deregulation of natural gas; high oil prices; mistrust of nuclear power; cheaper and more efficient coal combustion technologies such as oil/coal and water/coal mixtures; coal slurry pipelines; acid rain legislation promoting use of low-sulfur coal; technologies allowing extraction of methane from deep coal beds through drill holes and in-situ gasification; procedures allowing cleaner and more efficient use of coal such as fluidized bed combustion and magneto hydrodynamics; and cheaper and more environmentally acceptable coal gasification or liquefaction techniques.

New federal coal production would tend to be limited by factors such as: high railroad freight rates; economic recession; the State of Montana's 30% severance tax; development of nearby Indian coal; increased electricity production from hydropower, nuclear, oil and gas, photovoltaic, and wind sources; energy conservation; and acid rain legislation with mandatory scrubbing requirements regardless of the type of coal.

OTHER MINERALS

Oil and Gas

Oil and gas occurs in Cretaceous and older formations throughout the Resource Area. As of 1983 there were eight producing oil and gas fields (See Map 3-3). One additional field is abandoned. The following statistics were summarized from the Annual Reviews of the Montana Oil and Gas Conservation Division.

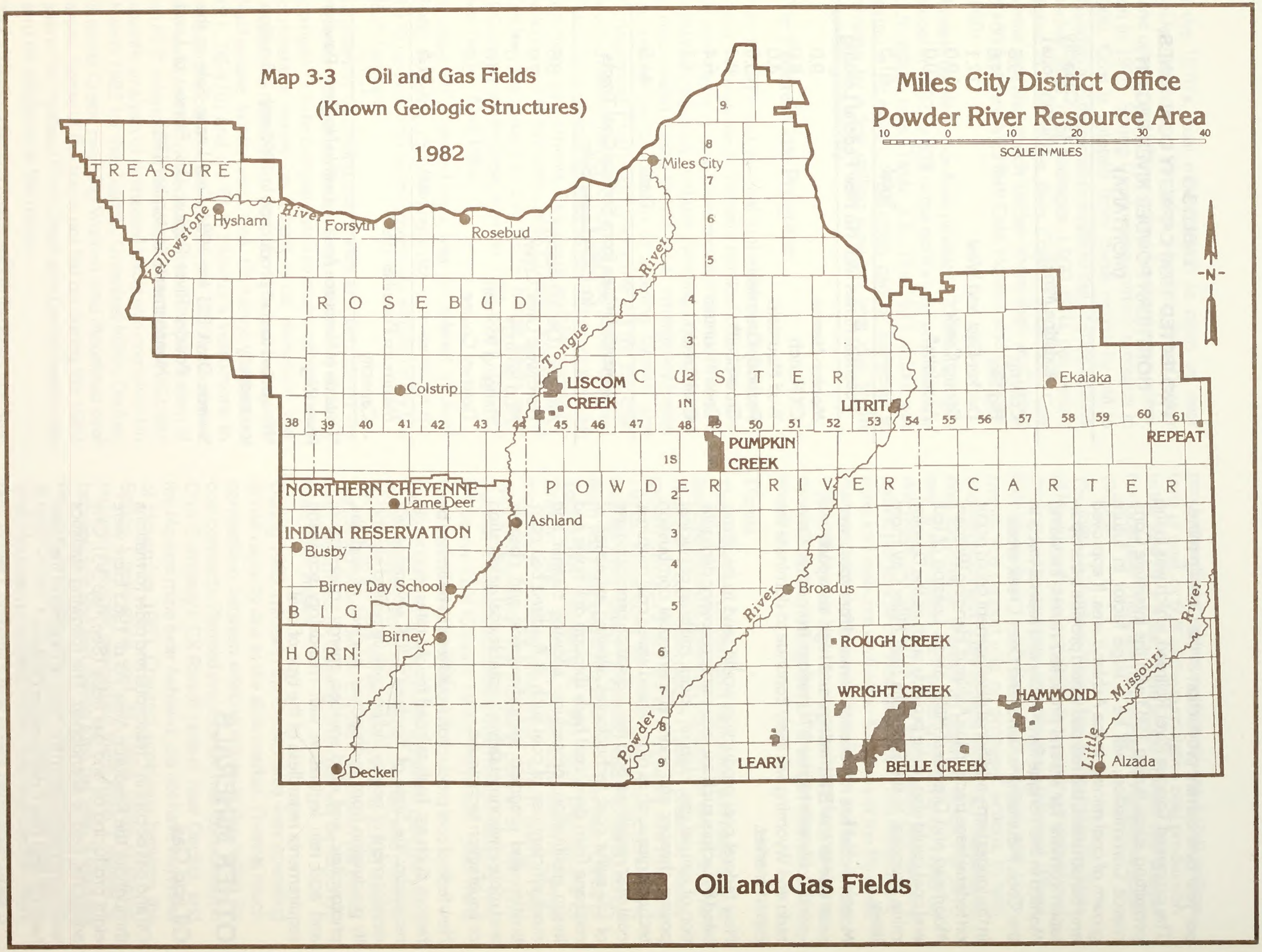
TABLE 3-3
PROJECTED 1990 CAPACITY COAL MINES, NORTHERN POWDER RIVER REGION (MONTANA)

Existing Mines	1990 Capacity (Million Tons)
Colstrip	19.8
Big Sky	4.6
Decker-East and West	17.1
Spring Creek	10.0
Absaloka*	10.0
Total	61.5
Potential Mines with No New Federal Leasing	
Montco-Nance	9.0
CX Ranch	8.0
Wolf Mountain	4.0
Peabody-Greenleaf	5.0
Crow-Shell*	8.0
Cook Mountain	6.4
Coal Creek	4.1
Total	44.5
Potential Mines from Federal Coal Tracts in 1984 Lease Sale	
Ashland (Decker-Birney)	8.6
Northwest Otter Creek	7.9
Mud Springs	0**
Hanging Woman	10.0
Downey Coulee	5.0
Total	31.5
Maximum Potential 1990 Capacity	137.5

*Outside of Resource Area but within Northern Powder River Region

**Projected to start production in 1992 with 7.5 million ton capacity

Source: Draft EIS for 1984 Coal Lease Sale in the Powder River Region, U.S. Bureau of Land Management, September 1983



Map 3-3 Oil and Gas Fields
(Known Geologic Structures)
1982

In 1982, total oil production was 3.00 million barrels. Of this total, 2.95 million barrels, or 98%, came from the unitized Belle Creek field and its small associated satellite fields, which produce from a pay zone up to 40 feet thick in the Cretaceous Muddy Formation. A total of 175 wells in the Belle Creek field produce both oil and gas. Two wells produce only gas. Shut-in wells total an additional 136 for oil and two for gas. Average well depth is 4,400 feet. The Belle Creek field was discovered in 1966 and has produced 119.5 million barrels through 1982. The best production year was 1968 when 16.5 million barrels were recovered. Secondary recovery was initiated in 1970 and tertiary recovery in 1981. Belle Creek was the second largest producing oil field in Montana in terms of 1982 production and is second only to Cut Bank in cumulative production.

The other three small oil fields in the Resource Area—Leary, Repeat, and Wright Creek—have cumulatively produced 0.445, 0.494 and 0.232 million barrels, respectively. The Leary field has three producing oil wells and one shut-in; production is from the Muddy Formation at an average depth of 5,800 feet. The four producing wells and one shut-in well in the Wright Creek field obtain both oil and gas from the Muddy Formation an an average depth of 4,800 feet. The Repeat field has only one well; it produces from the Ordevician Red River Formation at a depth of 8,600 feet. One additional field—Rough Creek— is abandoned. Table 3-4 summarizes oil statistics for each field.

In 1982, total gas production was 332 million cubic feet. The Belle Creek field marketed 120 million cubic feet from the Cretaceous Muddy Formation along with the oil. The Liscom Creek field marketed 116 million cubic feet of gas from the Cretaceous Shannon Formation. The Pumpkin Creek field also produces from the Shannon Formation, but did not market any gas during 1982.

The Hammond field marketed 95 million cubic feet from the Cretaceous Muddy Formation. The Wright Creek field marketed one million cubic feet from the Muddy Formation. The Liscom Creek field has eight producing gas wells and one shut-in; average depth is 3,000 feet. The shut-in Pumpkin Creek field has eight gas wells; average depth is 2,900 feet. The Hammond field has nine producing gas wells and two shut-in; average depth is 2,000 feet. The Litrit field is a new discovery. Table 3-5 summarizes gas production statistics.

Seismic exploration activity was strong in 1982. Notices of Intent were received and permits were issued for 39 seismic lines, in contrast to a normal annual number of three to five. Most of the activity was south of Broadus and west of Belle Creek and involved only one oil company client.

About 3.1 million acres of oil and gas mineral rights in the Resource Area are federally owned. As of October 1982, approximately 2.4 million acres were covered by oil and gas leases, and most of the remaining area contained pending simultaneous lease applications. Approximately 40 Applications for Permit to Drill (APDs) are processed annually by BLM. During 1982, there were 202 producing wells. One hundred eighty-three produced oil only or oil with associated gas, and 19 produced gas only.

TABLE 3-4
YEARLY OIL PRODUCTION BY FIELD, 1973-1982
(Million Barrels)

Year	Belle Creek	Leary	Repeat	Wright Creek	Producing Wells in PRRA	Average Yearly Production Per Well
1973	8.137	.029	.010	.015	248	.033
1974	9.348	.024	.014	.011	235	.040
1975	8.671	.027	.013	.009	197	.044
1976	8.750	.047	.012	.010	182	.048
1977	9.061	.037	.011	.012	180	.051
1978	7.209	.034	.011	.010	181	.040
1979	5.676	.027	.011	.010	166	.034
1980	4.614	.037	.010	.009	149	.031
1981	3.718	.032	.009	.009	185	.020
1982	2.950	.030	.010	.009	183	.016
Annual Average	6.813	.032	.011	.010	191	.036

TABLE 3-5
GAS PRODUCTION BY FIELD BY TWO-YEAR INTERVALS
(in million cubic feet)

Year	Belle Creek	Hammond	Liscom Creek	Pumpkin Creek	Wright Creek	Total Million Cu. Ft.
1971-1972	3,540	—	19	—	—	3,559
1973-1974	1,391	—	962	—	—	2,353
1975-1976	973	—	607	1,185	—	2,765
1977-1978	852	—	458	384	—	1,694
1979-1980	766	—	321	85	2	1,174
1981-1982	346	161	177	8	3	695
Annual Average	656	81	212	208	1	1,020

Currently, BLM manages oil and gas activity in accordance with the 1980 Programmatic Environmental Assessment of the Miles City District's oil and gas leasing program, which is discussed in more detail in Chapter 2.

Present trends indicate that oil production from the Belle Creek field will continue to decline in the future as the field is depleted. The Hammond gas field is expanding and other shallow gas fields are expected to increase production if natural gas is deregulated. Rocks below the Cretaceous have been sparsely drilled and the potential for deeper discoveries, especially below the Madison Formation, is substantial. Deeper drilling may also increase in the trough of the Powder River Basin. Future fields will probably be dominated by stratigraphic traps with little structural control.

Geothermal Energy

There is limited geothermal energy potential. The Resource Area is a sedimentary basin far from outcrops of igneous rock and/or tectonic activity. Known resources are limited to warm and hot waters in Paleozoic carbonates and warm waters in Cretaceous sandstones found during the course of oil and gas exploration. The only present geothermal use is southeast of Ashland where several "dry" oil and gas wells were completed to provide warm water for stock (Sonderegger and Bergantino 1981).

Locatable Minerals

The only known locatable minerals are uranium and an uncommon variety of bentonite.

Uranium deposits are located in two distinct zones in the southeastern corner of the Resource Area. The first zone is associated with the Miocene Arikaree formation which is present in the Ekalaka Hills, Long Pines, Finger Buttes, and other isolated plateaus. Uranium is concentrated in the volcanic tuff and ash zones within the Arikaree formation and has also leached from the Arikaree and been deposited by groundwater in some underlying lignites (Denson and Gill 1965). Concentrations are generally under 100 parts per million, too small for economic mining as of 1983. In 1982, 45 sections in the Long Pines and Sheep Hills contained mining claims. The second zone is associated with two Lower Cretaceous sandstones, the Fall River and Lakota, where uranium roll front deposits occur at depths of 1,700 to 2,200 feet. Mining claims have been located within 153 sections and a number of companies have drilled several thousand exploratory holes near Alzada; in 1983, Kerr-McGee was the only company still actively drilling. No production of uranium has occurred through 1983. Due to the depressed state of the nuclear power industry and Montana laws requiring disposal of radioactive waste out of state, development in the near future is expected to be minimal.

Bentonite is found within many Cretaceous shales throughout the Resource Area (Berg 1970; Knechtel and Patterson 1962). The bentonite clay is used primarily for drilling mud and pelletizing iron ore. In 1981, the Resource Area produced 444 kilotons, or 9.5% of the total national production of 4,680 kilotons of bentonite. Within the past decade, bentonite has been mined by four companies — American Colloid, International Minerals Corporation, and Baroid in Carter County, and Hallett Minerals in Treasure County (see Table 3-6).

About 1,500 mining claims for bentonite, covering 47 sections, have been staked in southern Carter County. Seven claims, within three sections, have been staked in northern Treasure County. In 1982, no patents for bentonite claims were issued in Montana; however, recent court decisions could result in patenting of a number of claims involved in litigation. The future market for bentonite is tied closely with oil and gas production (which requires drilling mud) and steelmaking (which requires pelletized iron ore).

TABLE 3-6
BENTONITE PRODUCTION
(in thousands of tons)

Year	Hallett Minerals	American Colloid	Baroid and Other Producers	IMC	Total
1974	60.3	—	45.9	74.0	180.2
1975	6.8	3.6	—	90.5	100.9
1976	57.7	—	—	57.1	114.8
1977	95.3	38.0	—	55.2	188.7
1978	43.2	59.0	—	74.5	176.7
1979	22.5	115.0	—	133.0	270.5
1980	—	304.2	—	60.7	364.8
1981	—	380.5	—	63.7	444.2
Total	285.8	900.3	45.9	608.7	1,840.8

(Source: Montana Department of Revenue)

Management by the BLM of locatable minerals consists of recordation of mining claims, validity determinations, and implementation of the 43 CFR 3809 regulations, which protect and provide for reclamation of public surface following exploration and development. Surface protection regulations are implemented according to the provisions of a Memorandum of Agreement between BLM and the Montana Department of State Lands.

Saleable Minerals

Saleable minerals consist mainly of clinker and sand and gravel. Lesser amounts of petrified wood, agate, and building stone also occur.

Clinker is reddish to black, heat-hardened rock formed by the burning of coal beds and baking of overburden. Clinkered areas cover approximately 1,050 square miles within the Fort Union formation in the northern Powder River Basin and commonly cap ridges and form topographic benches. About 50 to 90 billion cubic yards of clinker are present. Because of its hardness, clinker is used for road surfacing in areas where gravel is not available. Coal mines in the Decker and Colstrip areas use clinker for surfacing haul roads and building pads for structures and equipment.

Sand and gravel deposits fill the major river valleys and cap terraces at varying elevations above river level. Major sand and gravel terraces occur about 300 feet above the Yellowstone River, and also cap ridges 1,000 feet above the Yellowstone River southwest of Forsyth. Terraces of coarse quartz sand occur along Little Beaver Creek north of Ekalaka. Several firms mine sand and gravel for road and construction projects.

Saleable minerals may be obtained under a free use permit by federal, state or local government agencies, but must be sold to individuals or corporations. As of mid-1983, there were three free use permits and three sales for mineral materials. Limited amounts of petrified wood and agate may be collected for casual use without charge.

No charge is made for clinker necessarily moved in the process of extracting coal under federal lease, as long as the clinker remains within the boundaries of the lease and is used for lease development.

Saleable minerals are reserved to the government on public lands and lands patented under the Stock Grazing Homestead Act.

In the near future, clinker and sand and gravel will continue to be used for road surfacing. Development of coal mines may increase the use of clinker. Completion of Interstate 94 and upgrading of State Highway 59 east and south of Miles City will require large amounts of sand, gravel and/or clinker.

Range

Range Vegetation

Rangeland ownership and associated AUMs are summarized in Table 3-7. Table 3-8 shows the condition of the BLM administered land as shown in Table 3-7. Table 3-9 shows, by county, the BLM administered acres and associated AUMs.

There are eight vegetative rangeland types in the Resource Area. See Map 3-4. They are central grassland, badlands grassland, eastern Montana Ponderosa pine forest, ponderosa pine savannah, sagebrush-saltbush, sandy grassland, southeastern grassland, and undifferentiated stream bottoms. From these types, an utilization of forage among livestock, wildlife and watershed is made to benefit vegetation management. The area is predominantly a needlegrass, wheatgrass and blue grama association (Figures 3-1 and 3-2). Areas within the resource area which have more than 10 percent canopy cover of trees are grazable woodlands. The general vegetative communities of the 10 soil subgroups are noted in Appendix J, along with possible management practices. Plant communities are described in detail by range sites (Map 3-5) in the USDA-SCS MT Technical Guide, 1983.

Riparian zones are defined as a specialized form of wet meadow producing specific vegetation types. See Figure 3-3. Riparian zones may include wet or subirrigated areas with vegetation common to wet meadow, subirrigated, saline lowland or overflow range sites. The relative vegetation composition (by weight) of grasses, forbs, and trees and shrubs on each range site (wet meadow, subirrigated or saline lowland) is shown in Table 3-10.

These riparian zones are used disproportionately more than any other vegetation type for livestock grazing, watering, shade, travel, wildlife habitat, and concentrated waterflow.

Floodplains and overflow range sites are often adjacent to riparian zones. Vegetation typical of upland sites receives additional moisture from overland flow. Woody vegetation may include silver sagebrush, snowberry, rose, buffaloberry, boxelder, elm, chokecherry, and cottonwood (USDA — SCS — MT. Tech Guide 1983).

Range Condition, Production and Trend

A range inventory was started in 1979 using a method of three transects per/strata which identified the current range condition. This proved too time consuming due to the number of strata, and the transects, were discontinued. Range condition mapping continued, along with some transects, using the SCS ecological site method, and was completed in 1982.

Ecological range condition is expressed as excellent, good, fair and poor to reflect the current vegetation composition of the rangeland in relation to the potential climax plant community. See Table 3-8. The following types were not given ecological condition ratings: unsuitable; tame pastures, contour furrowed areas and waterspreaders; agricultural resource study area, abandoned croplands and agricultural lands.

The opportunity for improving range condition and production with grazing management is greatest on clayey and/or loamy sedimentary uplands, alluvial terraces and floodplains. Grazing systems designed to provide for the needs of the vegetation would generally improve range condition in a relatively short time.

Range sites vary widely in production because of differences in soils. Silty and clayey are the dominant range sites and are among the more productive and responsive sites. Vegetation production on rangelands varies widely with fluctuations in precipitation. Timing of precipitation is critical. Production is lower than normal when precipitation is low or when precipitation occurs during plant dormancy periods. Critical rainfall periods are in the fall before freeze-up and in the spring during early plant growth of the dominant cool season grasses.

TABLE 3-7
LAND OWNERSHIP AND ASSOCIATED AUMs

	Acres	Percent of Total	AUMs	Percent of Total
BLM Administered	1,080,675	21	208,083	16
Other	4,169,959	79	1,122,702	84
TOTAL	5,250,634	100	1,330,785	100

TABLE 3-8
CONDITION OF BLM ADMINISTERED RANGELAND

Condition	Acres	Percent
Excellent	32,867	3.04
Good	709,463	65.65
Fair	308,656	28.56
Poor	3,686	.34
Unsuitable for livestock grazing	9,895	.92
Tame pastures, contour furrowed areas & waterspreaders	15,482	1.43
Agricultural Research Study Area, abandoned croplands and agricultural land	626	.06
TOTAL	1,080,675	100.00

TABLE 3-9
BLM ADMINISTERED ACRES AND ASSOCIATED AUMs BY COUNTY

County	Acres	AUMs
Big Horn	27,017	5,618
Carter	511,159	88,435
Custer	186,958	36,206
Powder River	261,523	62,634
Rosebud	82,131	13,525
Treasure	11,887	1,665
TOTAL	1,080,675	208,083

TABLE 3-10
PERCENT RANGE SITE VEGETATION COMPOSITION

Range Site	Grasses	Forbs	Trees & Shrubs	Total
Wet Meadow	90	10	0	100
Subirrigated	75	10	15	100
Saline Lowland	75	5	20	100
Overflow	80	5	15	100

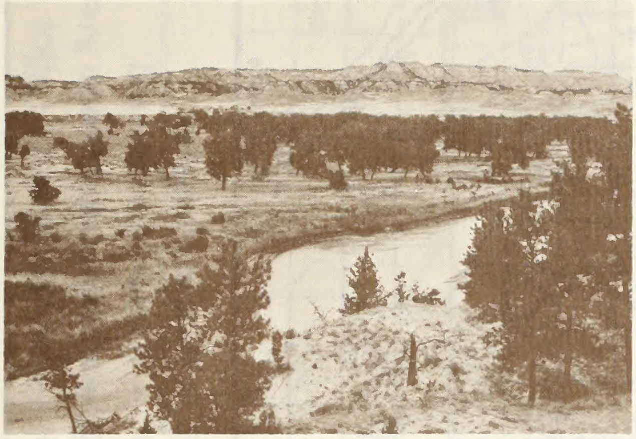


FIGURE 3-1

Typical area rangeland with deciduous trees occurring in waterways and north slope drainages.

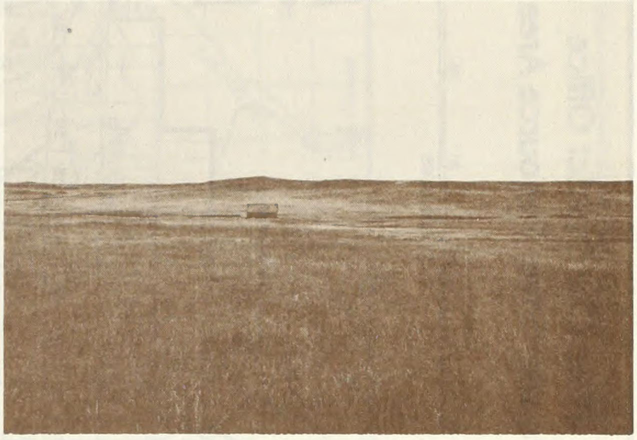
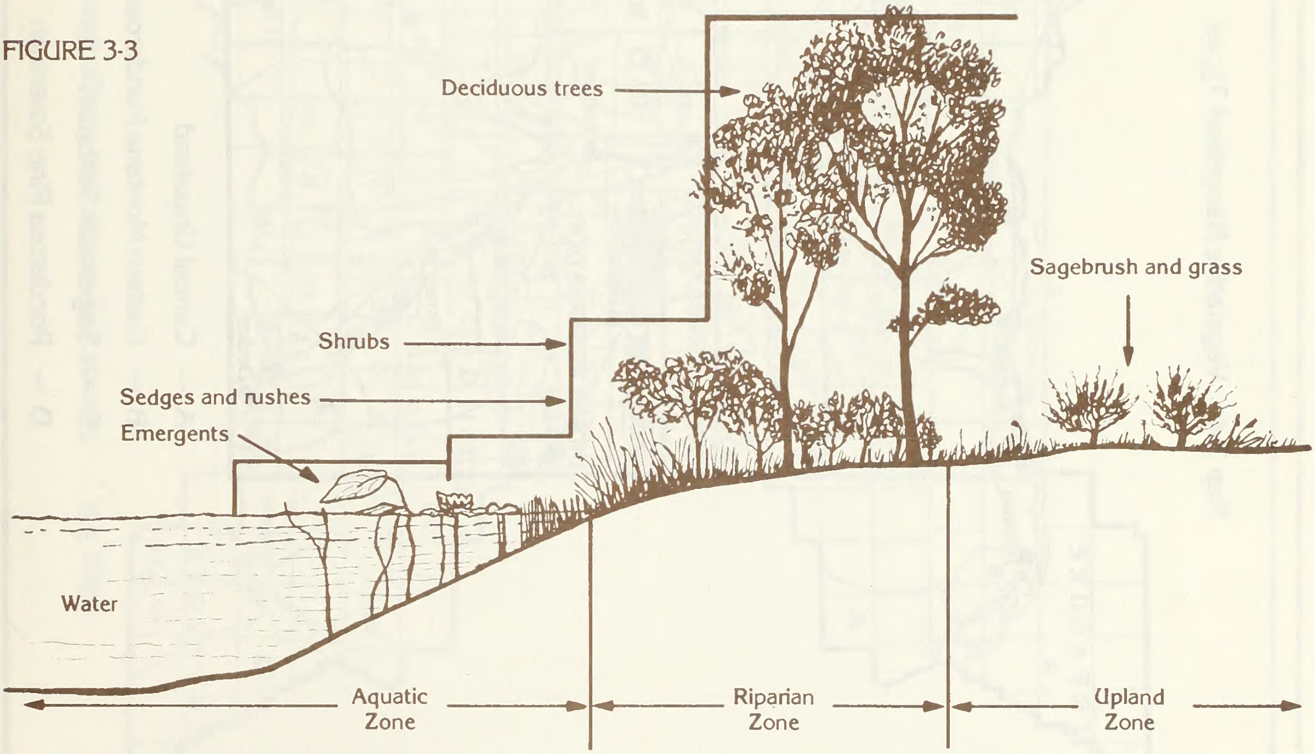


FIGURE 3-2

Typically rolling topography with predominantly a grass/shrub vegetation community.

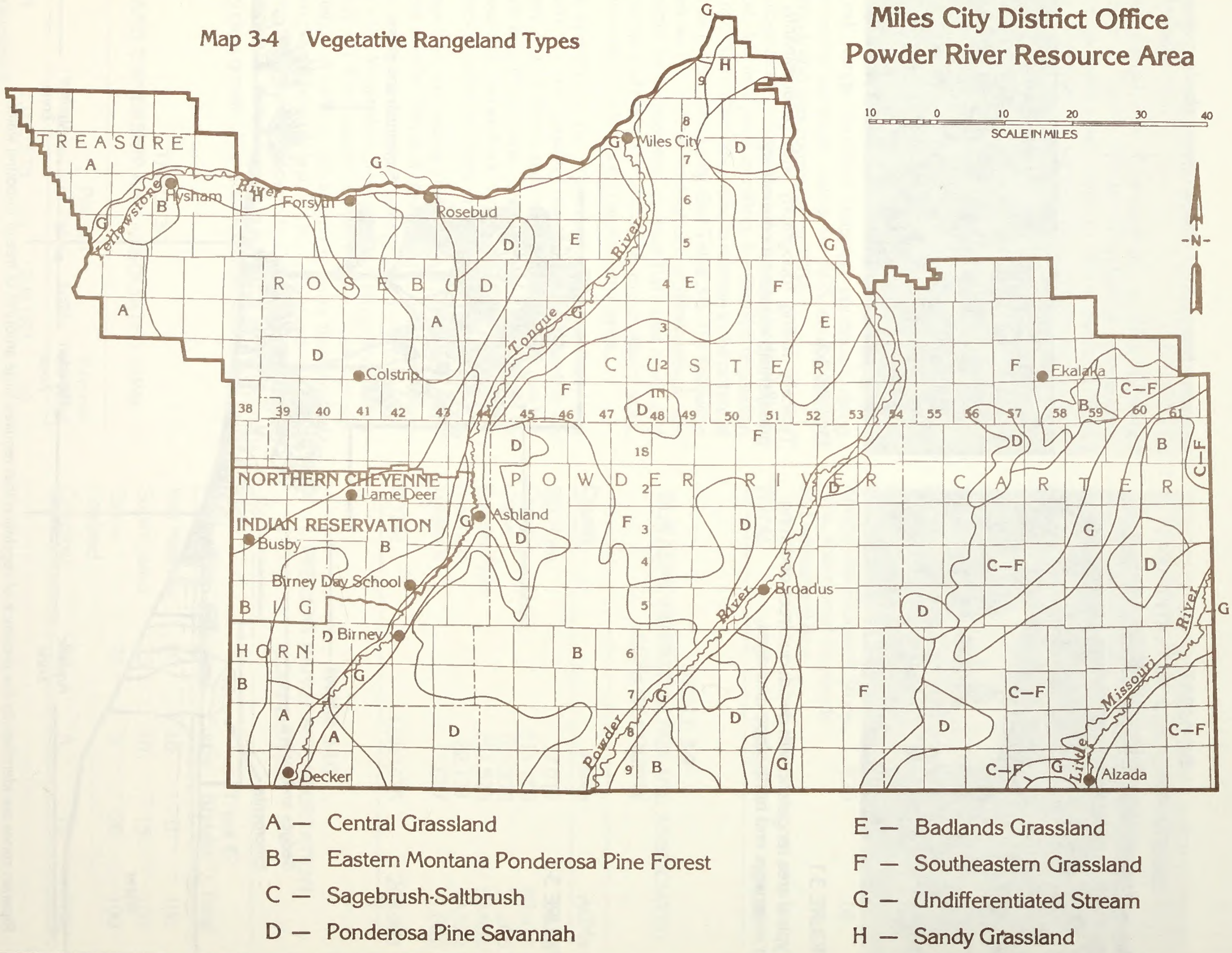
FIGURE 3-3



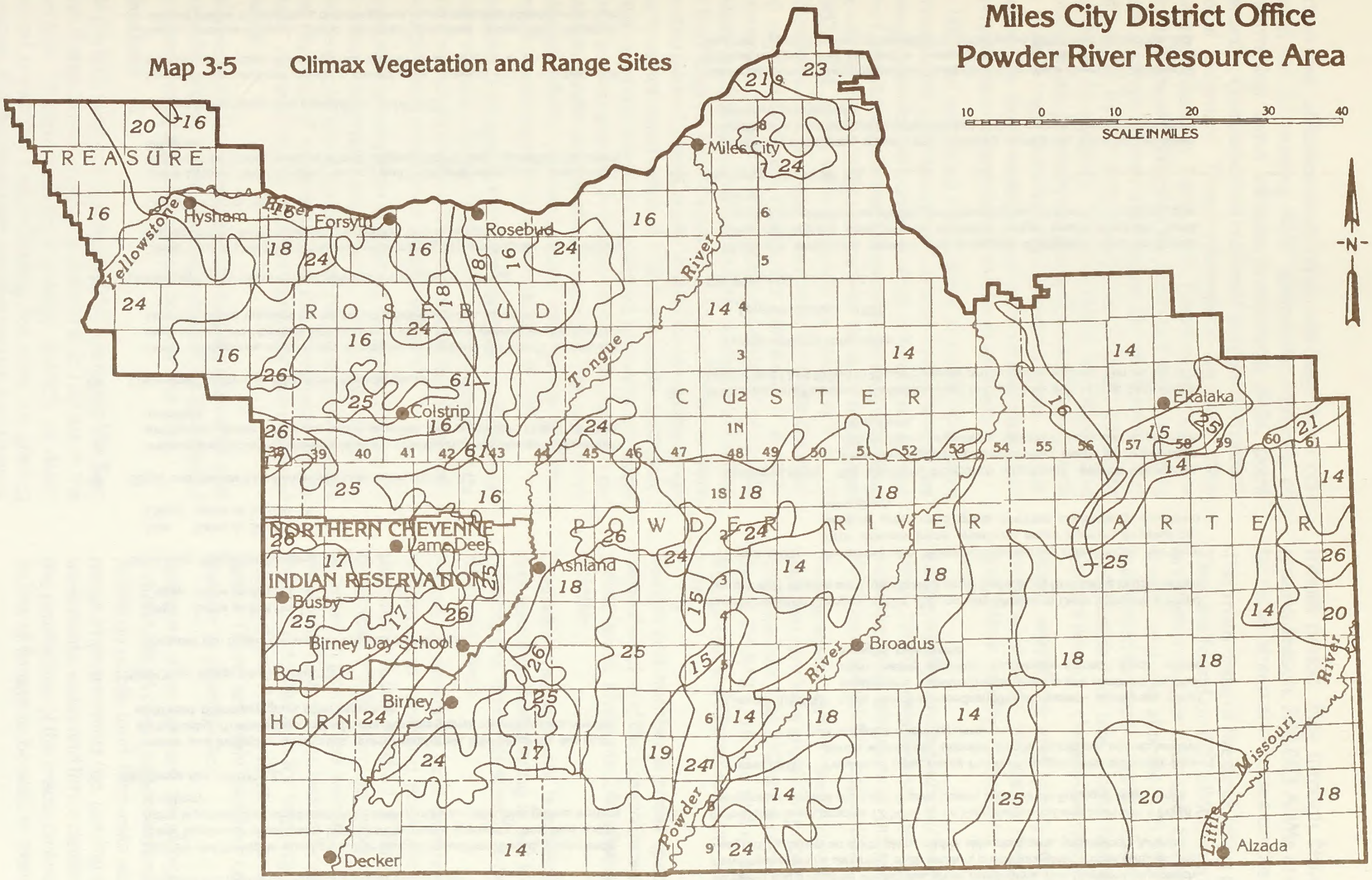
Riparian zones are identified by the presence of vegetation that requires large amounts of free or unbound water.

From: Thomas, J.W.; Maser, C.; and Rodier, J.E. 1979. Riparian zones in managed rangelands — their importance to wildlife. *In* Forum — Grazing and Riparian/Stream Ecosystems. Ed. Oliver B. Cope, Trout Unlimited.

Map 3-4 Vegetative Rangeland Types



Map 3-5 Climax Vegetation and Range Sites



Climax Vegetation and Range Sites Legend

14 Silty Range Site, 10-14", P.Z.

(Includes thin breaks too small or irregular to delineate)

Western and thickspike wheatgrass, little bluestem, needleandthread, green needlegrass, bluebunch wheatgrass, big bluestem, prairie junegrass, threadleaf sedge, native legumes, silver sagebrush, skunkbush sumac, winterfat, blue grama, western snowberry.

15 Silty Range Site, 15-19" P.Z.

Western and thickspike wheatgrass, green needlegrass, little bluestem, big bluestem, bluebunch wheatgrass, Idaho fescue, sideoats grama, native legumes, needleandthread, prairie junegrass, silver sagebrush

16 Silty-Clayey Range Site Complex, 10-14" P.Z.

(Includes thin breaks too small or irregular to delineate)

Silty: Same as Site No. 14
Clayey: Same as Site No. 18

17 Silty-Clayey Range Site Complex, 15-19" P.Z.

Silty: Same as Site No. 15
Clayey: Same as Site No. 19

18 Clayey and Shallow Clay Range Site Association, 10-14" P.Z.

Western and thickspike wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, prairie junegrass, native legumes, big sagebrush, Nuttall saltbush, winterfat.

19 Clayey and Shallow Clay Range Site Association, 15-19" P.Z.

Green needlegrass, western and thickspike wheatgrass, bluebunch wheatgrass, basin wildrye, big bluestem, little bluestem, Idaho fescue, prairie junegrass, prairie sandreed, native legumes, big sagebrush, Nuttall saltbush, winterfat.

20 Dense Clay-Clayey-Saline Upland Range Site Complex, 10-14" P.Z.

Dense Clay: Western and thickspike wheatgrass, green needlegrass, basin wildrye, big sagebrush, Nuttall saltbush, greasewood, prairie junegrass.

Clayey: Same as Site No. 18

Saline Upland: Alkali sacaton, western and thickspike wheatgrass, greasewood, basin wildrye, Nuttall saltbush, inland saltgrass, bottlebrush squirreltail, Sandberg bluegrass.

21 Sands and Sandy Range Site Association, 10-14" P.Z.

Sands: Prairie sandreed, needleandthread, sand bluestem, Indian ricegrass, little bluestem, sun sedge, native legumes, skunkbush sumac, yucca.

Sandy: Needleandthread, prairie sandreed, threadleaf sedge, little bluestem, sideoats grama, big bluestem, native legumes, blue grama, skunkbush sumac, rose.

23 Badlands, 10-14" P.Z.

Western and thickspike wheatgrass, green needlegrass, little bluestem, bluebunch wheatgrass, prairie sandreed, alkali sacaton, prairie junegrass, Nuttall saltbush, big sagebrush, American vetch, plains muhly, sideoats grama, greasewood, juniper

24 Forest-Grassland Complex, 12-14" P.Z., on Very Shallow to Deep Soils with a Frigid Temperature Regime and Light Brown, Loamy Surfaces on Rolling to Hilly Terrain

Forest: (50%) Ponderosa pine, Rocky Mountain juniper, little bluestem, bluebunch wheatgrass, sideoats grama, skunkbush sumac, western wheatgrass, native legumes.

Grassland: (50%) Little bluestem, needleandthread, western wheatgrass, green needlegrass, bluebunch wheatgrass, prairie sandreed, big bluestem, native legumes, skunkbush sumac, yucca, prairie junegras, blue grama.

25 Forest-Grassland Complex, 15-19" P.Z., on Very Shallow to Deep Soils with a Frigid Temperature Regime and Light Brown, Loamy Surfaces on Undulating to Hilly Terrain

Forest: (60%) Ponderosa pine, bluebunch wheatgrass, Idaho fescue, little bluestem, sideoats grama. snowberry, native legumes, arrowleaf balsamroot. green needlegrass, common chokecherry, saskatoon serviceberry.

Grassland: (40%) Big bluestem, bluebunch wheatgrass, western wheatgrass, green needlegrass, needleandthread, prairie junegrass, basin wildrye, lupine, snowberry, saskatoon serviceberry, common chokecherry.

26 Ponderosa Pine Forests on Moderately Deep to Deep Soils with a Frigid Temperature Regime and Light Brown to Brown Surfaces on Undulating to Steep Terrain, 15-19" P.Z.

Typical overstory composition is:

Ponderosa pine 100%

27 Silty Range Site, 10-14" P.Z.

Bluebunch wheatgrass, western and thickspike wheatgrass, needleandthread, green needlegrass, basin wildrye, threadleaf sedge, prairie junegrass, native legumes, big and silver sagebrush, skunkbush sumac, common chokecherry, blue grama.

28 Silty Range Site, 15-19" P.Z.

Bluebunch wheatgrass, western and thickspike wheatgrass, Idako fescue, green needlegrass, basin wildrye, needleandthread, native legumes, big sagebrush, sticky geranium, prairiesmoke

61 Hardwood Climax Forests on Alluvial Floodplains Along Major Rivers and Growing on Shallow to Deep, Well Drained to Poorly Drained Soils with Frigid Temperature Regimes. Typical overstory composition is: Cottonwood, 80%; Other hardwoods, 20%.

Actual use, utilization and trend data have been collected on 27 existing AMP allotments. Methods of determining trend include photo-trend plots, point transects, comparison of recurrent surveys and professional judgment. Trend information on these allotments is found in Table 2-10. Trend is in a stable or slightly upward direction as indicated by comparing several range surveys which cover the same area and is evidenced by the preponderance of good or better condition rangelands. Those areas in less than good condition are generally the result of several factors such as prairie dogs, livestock concentration areas, or noxious weeds. Such areas generally are not the result of an overallocation of vegetation, but local overuse.

In 1980, an estimated 4,900 acres of public land were infested with leafy spurge or Canada thistle. Weeds are being controlled on a small scale to control leafy spurge and Canada thistle where the permittees are controlling weeds on their contiguous private land. In fiscal year 1982, 174 acres were planned for treatment in 10 allotments. The acreage figure may fluctuate depending upon budget and manpower restraints. In a coordance with current (1983) policy guidance, Tordon 2K pellets or 22K liquid is used on leafy spurge and Tordon or Roundup on Canada thistle. A total of 79 acres were treated by the Carter County Weed Board and the range users under supervision of a BLM pesticide applicator. Other noxious weeds in significant amounts are cocklebur and knapweed. A biological control program on Canada thistle and spotted knapweed has also been initiated. Many of the noxious and range problem weeds would expand at an annual rate of 25%.

Invasion of ranges in excellent condition and displacement of useful forage is common with noxious weeds. They are not limited to disturbed or low condition areas, though these areas favor weed infestation.

Vegetation production and range condition are greatly reduced on prairie dog towns. Range condition on prairie dog towns is usually poor because of the continual clipping of vegetation and the conversion of the plant community to invader and low successional plants.

No rare or endangered plant species are known to exist on public lands in the Resource Area. One threatened species, Rorippa calycina, does occur in the area.

Livestock

Of the 642 livestock operators, 514 are inside the Section 3 area (inside a grazing district) and 128 are in the Section 15 area (outside a grazing district) as determined under the Taylor Grazing Act rules for grazing districts. For the most part, grazing occurs over a seven-month period, May through November. During the grazing season, 208,083 AUMs are authorized for use by cattle, sheep and horses on the public lands.

The main class of livestock using public land is cattle. They are found on 607 allotments and 182,027 AUMs are authorized for their use. Sheep graze on 75 allotments and are allocated 25,555 AUMs. Horses are authorized to graze on seven allotments and 501 AUMs are provided for use. These figures include combinations of livestock classes that graze on these allotments.

Water availability and quality are limiting factors on some allotments and cause major disruption in AMP and other grazing schedules during unusually dry years.

Range surveys and adjudications in the late 1950's and early 1960's established the current livestock use authorizations. Vegetation utilization estimates were also made for wildlife populations at the same time.

Twenty-seven AMPs were developed cooperatively between ranchers and BLM prior to June 1975. These AMPs include 148,232 acres of public lands in the area. Of the 27 AMPs, 10 use rest rotation grazing systems and 17 use a deferred rotation grazing system (Table 2-10).

Season and number licenses specify the number and class of stock and the season those animals can use the public lands. There are 246 allotments licensed in this manner.

Custodial management is applied to 369 allotments and specifies that grazing is not to exceed the grazing capacity but does not specify grazing seasons or livestock numbers.

Future demands on land depend a great deal on the farming and ranching economic index (supply and demand) of the product. If farming becomes more profitable, the BLM could expect to have a significant increase in permittees wanting to farm (crop) applicable areas (Class III or better land) instead of grazing them. Currently, and for the projected future, grazing demand and AUM utilizations are expected to remain static. There are only isolated cases of requests for change in grazing use.

However, if an upward trend occurs in the livestock industry, BLM could expect a demand for more grazing AUMs on public land. Requests would also increase for range improvements (i.e. grazing systems, mechanical treatments, water and fence developments) to increase the production of the resource and allow an increase in AUMs of forage to be sold to permittees.

Hydrology

Surface Water

The area is drained by tributaries of the Yellowstone and Missouri Rivers. Major tributaries of the Yellowstone River include Rosebud, Otter, Armells, Hanging Woman, and Mizpah Creeks, and the Tongue, Little Powder, and Powder Rivers. Major tributaries of the Missouri River are the Little Missouri River and Box Elder Creek.

Estimated mean annual runoff in inches for selected drainage basins showed no discernible pattern. Many of the drainage basins have a mean annual runoff of less than 0.60 inch; the maximum observed mean annual runoff was 4.45 inches (Ferreria 1981). High runoff usually results from snowmelt and intense summer storms. Streamflow decreases from July through early September because precipitation is low and evapotranspiration is high. Surface runoff is depleted by numerous stockwater reservoirs and spreader systems on small tributaries, evapotranspiration and seepage. Potential evapotranspiration greatly exceeds yearly precipitation.

Water quality characteristics often are influenced by whether the water was contributed to the stream as surface runoff or as base flow. Water contributed as base flow has been in contact with soil and rocks for long periods of time and, therefore, contains larger concentrations of dissolved solids (DS) than surface runoff water. DS concentrations range from 1,500 to 5,000 milligrams per liter (mg/l), with major ions being sodium and sulfate, calcium, magnesium, and bicarbonate are also present. Surface runoff water is dominated by calcium, magnesium, and bicarbonate ions with DS concentrations ranging from about 300 to 3,500 mg/l.

Most streams exhibit an increase in DS concentrations in the downstream direction owing to irrigation return flow, increased base flow contributions, and man induced pollution. Many downstream changes in DS concentrations and major ions are rather abrupt and appear to correlate with changes in lithology (Knapton and McKinley 1977).

Surface water is used primarily for stock watering and irrigation, although the sodium absorption ratio (SAR) is generally so high that use as irrigation water is marginal.

Groundwater

Shallow aquifer systems occur generally wherever members of the Fort Union, Hell Creek or Fox Hills formations exist. However, these formations have been eroded away in large parts of Treasure County and Carter County. Lack of adequate surface water quantities necessitates a heavy dependence on groundwater. Average density is eight to 15 wells per township (MBMG 1978). Wells are used mainly for domestic use and stock watering. A smaller number of wells supply municipal and irrigation needs.

The aquifers most commonly used in the Fort Union Formation are sandstone and coal beds. The sandstone beds are lenticular and generally do not extend more than a few miles; whereas coal aquifers are more areally extensive. Wells are generally 200 feet deep and provide adequate water for domestic and stock use.

The Fox Hills—Hell Creek aquifer underlies the Fort Union formation. It is the most extensive of the shallow aquifer systems and yields of up to 200 gallons per minute (gpm) have been reported.

Recharge to the shallow aquifer system is mainly in upland areas through sandy zones, clinker areas, and terrace deposits.

Downward movement of recharge water in the shallow aquifer system is retarded by shale layers of low permeability. The groundwater then flows across the tops of these shale layers generally in the direction of the surface topography. Discharge occurs as springs and seeps, where the impermeable beds are exposed, usually in lowland stream valleys.

Quaternary alluvium contains the shallowest aquifers. Most alluvium is too fine-grained to yield much water. However, clean, coarse-grained material along rivers may yield up to several hundred gallons per minute. Recharge to alluvial aquifers occurs from precipitation, runoff, and upward seepage from underlying formations. Discharge is by evapotranspiration, seepage into streams, pumpage, or groundwater flow to older formations (BLM 1981).

In Treasure and Carter Counties, where the Fort Union formation has been eroded away, the Bearpaw confining layer is exposed and consists of Bearpaw and Pierre shales. These shales have very low permeability and generally do not yield water wells.

The chemical quality of the water from the shallow aquifers is highly variable as shown in Table 3-11. DS concentration ranges from 100 to more than 8,000 mg/l, but Hodson and others (1973) state that the DS content of water from most wells is between 500 and 1,500 mg/l. As water moves downward through formations, the chemical type is changed by cation-exchange softening and sulfate reduction. The water from wells less than 200 feet deep generally is hard (calcium-magnesium-sulfate type) whereas, water from deeper wells generally is soft (sodium-bicarbonate type). Water from the deeper wells is typically lower in total DS, indicating that chemical precipitation occurs as the water moves downward (BLM 1981).

TABLE 3-11
SUMMARY OF SELECTED CHEMICAL CONSTITUENTS IN WATER FROM WELLS AND SPRINGS IN THE NORTHERN POWDER RIVER BASIN, SOUTHEASTERN MONTANA (LEE 1980)

Dissolved constituent concentration, in milligrams per liter

Source of water	Number of samples	Statistical category	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (CO_4)	Chloride (Cl)	Dissolved solids
Springs	149	Minimum	9.5	3.0	6.6	2	5	0	15	1.3	160
		Mean	110	140	240	10	580	2	830	8.0	1,630
		Maximum	440	510	1,800	31	1,500	37	5,500	36	5,260
Well Depth less than 200 feet	375	Minimum	1.7	.3	3.2	1	20	0	0	.4	110
		Mean	120	120	410	8	650	2	1,100	13	2,100
		Maximum	460	680	1,900	48	2,000	53	4,400	120	6,300
Well Depth greater than 200 feet	141	Minimum	1.0	.1	13	1	230	0	.1	3.0	390
		Mean	32	27	450	4	850	14	390	36	1,400
		Maximum	350	330	1,700	14	2,000	440	3,300	770	5,720

Water quality in most alluvial aquifers is poor, with some DS concentrations exceeding 8,000 mg/l. The quality is similar to that in the upper 200 feet of the shallow aquifers, but may be higher in DS due to concentration by evapotranspiration (BLM 1981).

Sediment and Water Yields

Sediment is moved by fluvial processes from its point of origin into channels and then into ponds, if present, or eventually into major river systems. Materials in transport are sand, silt and clay; however, most of the material transported through drainage basins is clay. Vegetative cover in the watershed slows the removal of sediment by increasing infiltration of rain and snowmelt water and reducing the velocity of runoff water. Measuring the sediment yield from watersheds is a good indicator of the condition of the watershed and generally indicates range condition as well.

Sediment removal from various watersheds was determined by measuring sediment deposition in ponds. Sediment volumes were converted to annual sediment yields by considering the drainage areas and the number of years of sediment accumulation (Table 3-12 and Appendix I).

Water yields were determined using results from a U.S. Geological Survey Investigation (Omang, Parrett, and Hull 1983).

Soils

The soils are derived from soft, sedimentary bedrock consisting of siltstone, shale, sandstone and clinker beds.

Soils in the region vary considerably over short distances in depth and profile development, reflecting differences in mean annual precipitation (10-19 inches/year), aspect, underlying bedrock, geomorphic stability and vegetation. Most of the soils are young, poorly developed, calcareous and relatively low in organic matter.

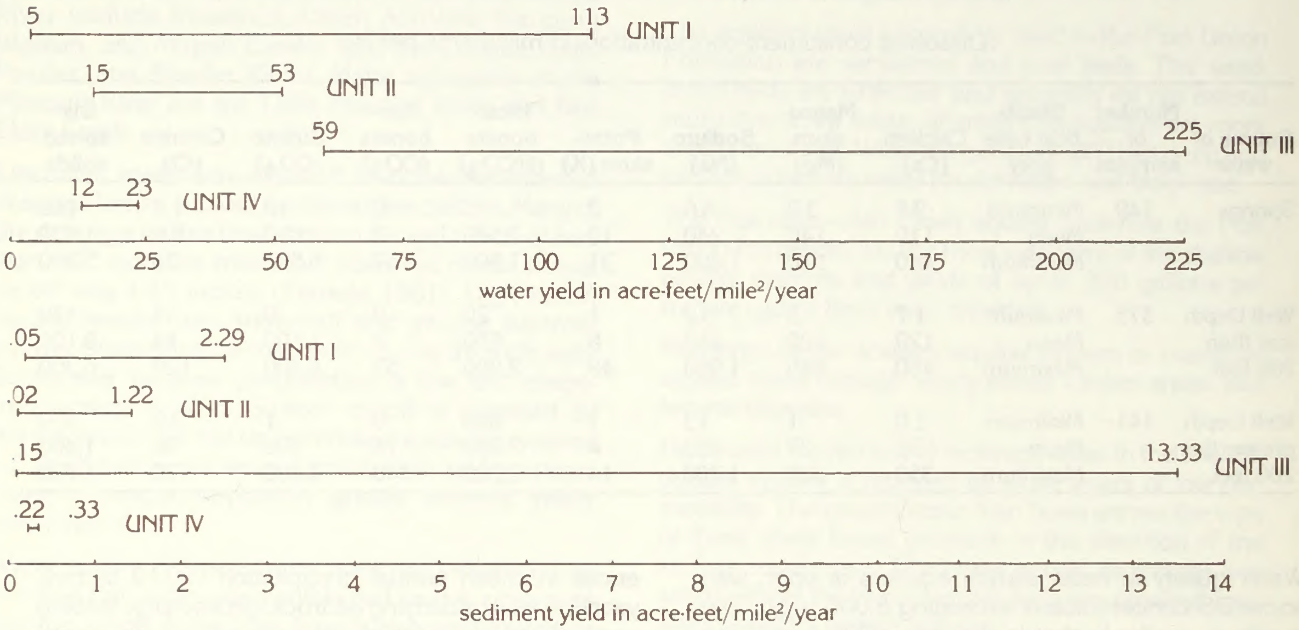
The area is comprised of 10 geomorphic soil subgroups, indicating topographic and aerial location and soil properties. For discussion purposes, these subgroups have been combined into five groups, based on landscape position and parent material. (See Map 3-6.)

A) Soils on floodplains, fans and low terraces:- These soils are located on nearly level to strongly sloping (0-15%) slopes along the major streams and rivers that occur throughout the Resource Area. The soil textures are clayey, loamy and sandy, which have been formed in alluvium and have a moderate to high water erosion hazard (subgroup 1).

B) Soils on fans, benches and terraces: These soils are located on nearly level to strongly sloping (0-15%) slopes in close proximity to the Yellowstone River. The soil textures are loamy and sandy, which have formed in alluvium and have a moderate to high water erosion hazard (subgroup 2 and 3).

C) Soils on dissected sedimentary bedrock plains and hills: These soils are located on nearly level to steep (0-45%) slopes throughout most of the Resource Area, excluding the southeastern corner of the area. The soil textures are clayey, loamy and sandy, which have formed in sandstone and shale and have a low to high water erosion hazard, depending upon slope and soil texture (subgroups 4, 5, 6, 7).

TABLE 3-12 SEDIMENT AND WATER YIELD POTENTIAL OF GEOLOGIC PARENT MATERIAL UNITS (REPRESENTS 97.6% OF THE PUBLIC LAND ACREAGE)



UNIT I	TONGUE RIVER MEMBER	40% OF ACREAGE
UNIT II	LEBO & TULLOCK MEMBERS	41% OF ACREAGE
UNIT III	PIERRE, NIOBRARA, CARLILE SHALES	15% OF ACREAGE
UNIT IV	FOX HILLS — HELL CREEK FORMATION	4% OF ACREAGE

SOURCE: OMANG, PARRETT, HULL (1983) & BLM (1983)

D) Soils on dissected shale plains and badlands: These soils are located on strongly sloping to very steep (8-70%) slopes in dissected shale plains and badlands and river breaks in the southeastern corner of the area. The soil textures are predominantly clayey and have a moderate to high water erosion hazard (subgroup 8 and 9).

E) Soils on low terraces, fans and floodplains: These soils are located on nearly level to strongly sloping (0-15%) slopes in the southeastern corner of the area. They are predominantly clayey in texture, which have formed in alluvium and have a moderate to high water erosion hazard (subgroup 10).

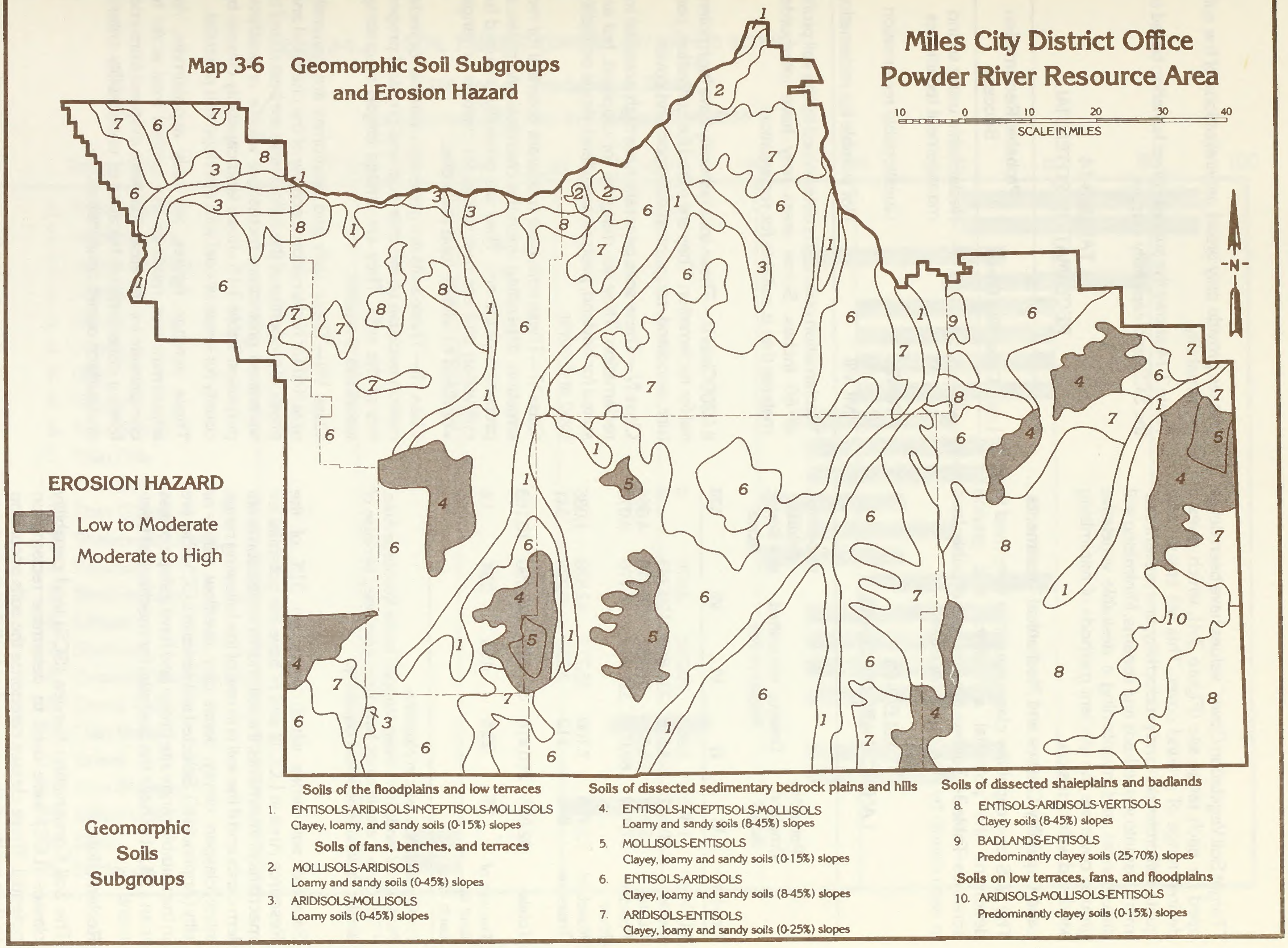
Erosion

The erosion hazard of these soils is influenced by soil infiltration, permeability, texture, structure, slope, presence of salts and the amount of ground cover present. Slow infiltration and permeability will increase the amount of runoff and erosion. These factors, in combination with reduced cover on bare soil and slopes steeper than 8%, will increase the water erosion hazard.

Based on the geomorphic groups, the water erosion hazard has been determined for the public lands. Approximately 92% (996,159 acres) of the area (subgroups 1, 2, 3, 6, 7, 8, 9, 10) has a moderate to high water erosion hazard and 8% (81,050 acres) (subgroups 4, 5) has a low to moderate water erosion hazard. Wind erosion hazard is also high, with reduced vegetative cover being a prime factor in contributing to the erosion hazard.

To reduce runoff and soil loss, a minimum amount of vegetative cover is needed to protect areas that are influenced by accelerated and geologic erosion. Accelerated erosion through overgrazing, off-road vehicle use or cultivation is preventable with careful management.

Some areas in the Resource Area are subject to geologic erosion. This type of erosion occurs naturally, because the material from which these soils formed is highly erodible with steep slopes and sparse vegetative cover. Some of these areas are unsuitable for grazing, because of slopes steeper than 50%. Many areas in this erosion group are subjected to grazing, which requires special management to keep erosion near the natural level.



Map 3-6 Geomorphic Soil Subgroups and Erosion Hazard

Miles City District Office
Powder River Resource Area
10 0 10 20 30 40
SCALE IN MILES
N
EROSION HAZARD
▨ Low to Moderate
☐ Moderate to High
Geomorphic Soils Subgroups
Soils of the floodplains and low terraces
1. ENTISOLS-ARIDISOLS-INCEPTISOLS-MOLLISOLS Clayey, loamy, and sandy soils (0-15%) slopes
Soils of fans, benches, and terraces
2. MOLLISOLS-ARIDISOLS Loamy and sandy soils (0-45%) slopes
3. ARIDISOLS-MOLLISOLS Loamy soils (0-45%) slopes
Soils of dissected sedimentary bedrock plains and hills
4. ENTISOLS-INCEPTISOLS-MOLLISOLS Loamy and sandy soils (8-45%) slopes
5. MOLLISOLS-ENTISOLS Clayey, loamy and sandy soils (0-15%) slopes
6. ENTISOLS-ARIDISOLS Clayey, loamy and sandy soils (8-45%) slopes
7. ARIDISOLS-ENTISOLS Clayey, loamy and sandy soils (0-25%) slopes
Soils of dissected shaleplains and badlands
8. ENTISOLS-ARIDISOLS-VERTISOLS Clayey soils (8-45%) slopes
9. BADLANDS-ENTISOLS Predominantly clayey soils (25-70%) slopes
Soils on low terraces, fans, and floodplains
10. ARIDISOLS-MOLLISOLS-ENTISOLS Predominantly clayey soils (0-15%) slopes

"Target Soil Vegetation Cover" values have been developed for each range site (Figure 3-4), which gives a desired range of ground cover. This will ensure adequate soil protection and productivity, and prevent sediment loss into watersheds and streams. Minimizing soil disturbances and maintaining a desirable vegetative ground cover are the efficient methods of minimizing wind and water erosion.

Land Capability Classes and Mechanical Treatments

The SCS land capability class groupings were used to determine the potential agricultural and grazing acreages. Table 3-13 shows the acreages of public land in each county by land capability class.

TABLE 3-13
LAND CAPABILITY CLASS

	*Potential Cropland Acres	Grazing, Watershed, Wildlife Acres			Watershed, Wildlife and Scenic Acres
County	**III**	**IV**	**VI**	**VII**	**VIII**
Big Horn	1,395	3,983	20,252	2,570	0
Carter	30,642	124,518	232,852	120,383	0
Custer	6,747	25,625	81,384	68,716	4,666
Powder River	37,439	89,078	121,907	8,170	4,070
Rosebud	5,799	7.100	25,717	42,828	1,086
Treasure	846	112	3,226	7,223	341
Totals	82,868	250,416	487,338	249,890	10,163
Percent of land in each class	8%	23%	45%	23%	1%

No Class I lands exist in Montana.
No Class V lands have been mapped in the Resource Area.
*The Class II and III lands have been combined because of similar dryland production capability.

Selected soil series which occur on 31% of the Resource Area in LCC III and IV have the potential for mechanical treatments, if a soil and/or vegetation problem exists and if the soil is in one of the following range sites: claypan, clayey, dense clay, overflow, sandy or silty (Appendix K). Selected soil series in LCC VI that are in the suitable range site group and have a slope of less than 15%, also have the potential for mechanical treatment.

Reclamation

The Soil Conservation Service (SCS) land capability classes (LCC) were used to determine reclamation potential. These classes categorize the soils according to their productivity, uses and potential management. Reclamation potentials based on the land capability classes provide only broad generalizations of the soils reclaimability.

Table 3-14 shows the success of reclamation based on the SCS land capability classes.

TABLE 3-14
RECLAMATION POTENTIAL

Land Capability Class	Probable Reclamation Success
III	Reclaimable using sound management techniques
IV, VI	Questionable reclamation
VII, VIII	Not suitable for reclamation

*Reclamation potential is determined by the soil profile to 60 inches. Some areas may have interburden material that is suitable for reclamation.

IL0200Class III—These soils generally have high potential for reclamation. They are suited for cultivation, pasture, woodland, range or wildlife food and cover.

Class IV—These soils generally have high potential for reclamation. They are marginal for cropland, but are suited for hayland, pasture, woodland, range or wildlife food and cover.

Class VI—These soils have moderate potential for reclamation, depending upon the chemical and physical properties of the soil. They are generally unsuited for cultivation and are best suited for pasture or range, woodland or wildlife food and cover.

Class VII—These soils are generally unsuited for reclamation because of the chemical and physical properties of the soils. They are limited largely to grazing, woodland or wildlife.

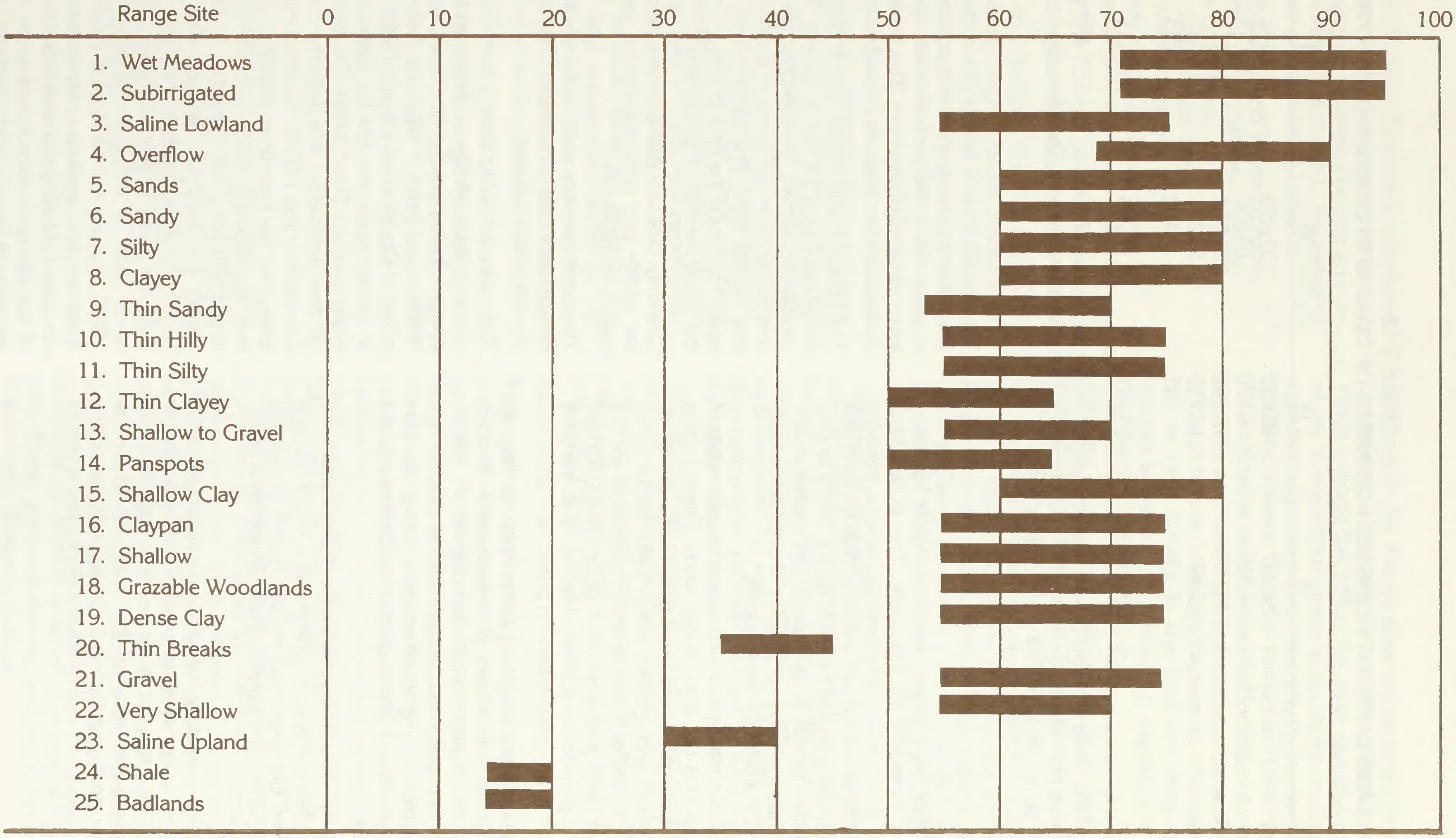
Class VIII—These soils and landforms are generally unsuited for reclamation, because of the chemical and physical properties of the soils. These are best suited to watershed protection, recreation, wildlife or aesthetic purposes. Table 3-15 shows land capability classes by county for areas of coal with development potential.

These acreage figures are only approximate. An adjustment was made to the original total acres to compensate for the areas that were dropped from coal leasing consideration because of unsuitability criteria and surface owner consultation.

Figure 3-4. SOIL TARGET COVERS ON RANGE SITES

(10″ to 14″ Precipitation Zone)

Percent Ground Cover in Excellent Condition



Soil/Range Sites are listed in the most productive to least productive order.

TABLE 3-15
LAND CAPABILITY CLASSES FOR AREAS OF COAL WITH DEVELOPMENT POTENTIAL

County	III	IV	VI	VII	VIII
Big Horn	24,787	48,632	153,455	11,304	22
*Custer	1,516	4,170	10,136	5,153	25
Powder River	146,118	118,862	221,901	24,541	3,978
*Rosebud	23,471	13,716	50,231	63,682	0
Treasure	65	191	1,482	953	109
Totals	195,957	185,571	437,205	105,633	4,134

*Much of the Custer County private surface has not been mapped as of 1983 by the SCS and parts of Rosebud County were not mapped because of negative consent from private landowners. Therefore, the figures for these two counties do not represent all of the surface acres.

Wildlife

Public lands are a major source of wildlife habitat in Montana, especially for big game. This public land, which is often in a natural or seminatural state, provides the diversity of habitat needed by wildlife for food and cover. It is the policy of the BLM (USDI 1981) to consider wildlife habitat in its multiple use management. Habitat management, not species or population management, is a primary responsibility.

Five major habitat types which support a wide variety of wildlife species occur on public lands. These habitat types include: grassland, sagebrush, conifer overstory, upland shrub, and riparian. Within these habitat types, there is a variety of subtypes which develop as each of the major types grades into each of the others. Agricultural land provides an additional habitat type, but does not occur to any great extent on public land.

Grassland habitats are found primarily on the flats, on gently rolling hills above drainages, and in open patches within pine forests and sagebrush stands. Some of the most common grasses that occur in this habitat type are: western wheatgrass, junegrass, blue grama, needle and thread, green needlegrass, and red threeawn.

The sagebrush habitat type consists of areas where one of the sagebrush species comprises most of the canopy cover. Big sagebrush occurs mainly on upland benches, while silver sagebrush occurs mainly in mesic bottoms.

The conifer overstory habitat type consists of areas where the canopy cover is mostly Ponderosa pine or juniper. The canopy can range from thick forest to extremely sparse savannah-like coverage. The most common landforms for this habitat type include moderately steep north and northwest slopes and edges of plateaus.

The riparian habitat type is characterized by the presence of one or more species of cottonwood, box elder, or green ash. A variety of other woody species are often associated with these trees. This habitat type is almost always found in creek and river bottoms.

The upland shrub habitat type is characterized by the dominance of a variety of shrubs. Rose, snowberry, skunkbush sumac, greasewood, plum, chokecherry, and buffaloberry are some of the dominant shrubs in this habitat type. The most common landform for upland shrubs is the drier drainage bottoms, usually in the upper reaches of watersheds.

Currently, 624,249 AUMs of vegetation are estimated for wildlife and nonconsumptive uses for soils and watershed protection.

There are two sites which have wildlife and recreation designated as the primary use. They are Dean S. Reservoir and Howery Island.

The scattered public land pattern makes it difficult to obtain precise wildlife numbers on these lands. The data available from the Montana Department of Fish, Wildlife, and Parks (FW&P) for the Resource Area is minimal. On a statewide basis, FW&P monitors trends in wildlife numbers, but the trend data comes with many cautions (Dood 1983). The available information on deer distribution was gathered during low population levels in the 1970's. All of the important deer use areas may not have been identified. Antelope distribution data, showing winter concentration areas, probably depict nontypical use patterns. The data was gathered during the extremely severe winter of 1978-1979. Recent literature suggests that these winter use areas were not prime habitat, but were areas of least snow cover used by desperate, starving animals (Barrett 1982). Subsequent winters have been too open and mild, so no significant concentration of antelope occurred to identify prime winter range. Some portions of the Resource Area have had no big game survey coverage to identify high use areas.

Wildlife data from a wide range of sources are displayed on overlays. This data base is dynamic; it changes as new reports and studies are received. The data sources for these overlays are listed in Appendix L. The variety of information displayed on the overlays includes:

Mule Deer Distribution and Wintering Areas;
Antelope Distribution and Wintering Areas;
White-tail Deer Distribution;
Sharp-tail and Sage Grouse Leks;
Sage Grouse Wintering Areas;
Turkey Distribution and Wintering Areas;
Raptor Nesting Sites;
Prairie Dog Towns.

Threatened and Endangered Species

The Resource Area encompasses current and historic ranges for three species (peregrine falcon, black-footed ferret and bald eagle) listed by the U.S. Fish and Wildlife Service (FWS) as threatened or endangered. No critical habitat has been delineated by the FWS in the area. Peregrine falcons historically nested in eastern Montana and some of these historic sites still exist. Recent sightings have identified the peregrine falcon only as a migrant. Black-footed ferret sightings have been reported over the years, with the last confirmed Montana sighting made in Carter County in 1977. Prairie dog towns, present in the region, provide suitable habitat for the ferret. No ferrets have been observed recently, although searches have been made. An inventory of all prairie dog towns and potential black-footed ferret habitat has not been completed.

Although there are no public lands set aside for the protection of prairie dogs and black-footed ferrets, the BLM is participating in the U.S. Fish and Wildlife Service's Black-footed Ferret Recovery Program. Sites may be identified in the future for the protection or reintroduction of this species.

Bald eagles migrate through the region and do winter on the Yellowstone, Powder, Tongue, and Little Missouri Rivers for as long as open water is available. Historical nesting habitat does exist throughout these riparian areas. As bald eagle numbers increase, we can expect to see reoccupied territories.

Big Game

Big game species that occur include mule deer, antelope, white-tailed deer, and bighorn sheep. Population sizes of these herds vary from year to year, depending on influences such as weather, range condition and annual harvest. Most crucial to the survival of these big game herds are the winter ranges where traditional use occurs during severe winter months.

Mule deer utilize all habitat types, but generally prefer sagebrush, grassland and conifer types. Broken terrain provides important cover in these habitats (Hamlin 1978). Browse is an important component in the mule deer annual diet. Recent observations by the Montana Department of Fish, Wildlife and Parks (Youmans, et al 1982), indicate that 73% of the mule deer observed in winter concentration areas in southeastern Montana were in rough topography, especially in pine dominated habitats. However, along the Powder and Little Missouri Rivers, riparian habitat accounted for 94% of the wintering mule deer concentrations, probably due to the lack of rough breaks. These are the habitats which are crucial to herd survival in the Resource Area. There appears to be little or no seasonal migration of mule deer in southeastern Montana.

Antelope prefer open, rolling grasslands and sagebrush habitats, where they feed primarily on forbs. Sagebrush is especially important to them in winter when snow limits their access to other foods. Healthy stands of sagebrush can be critical to the survival of antelope herds in southeastern Montana during severe winters. Antelope tend to move more than deer and will migrate out of an area when deep snows make food unavailable.

White-tailed deer are found primarily in riparian and conifer habitats. Concentration areas occur along river bottoms and in forested areas. Winter concentration areas occur almost exclusively in riparian habitats and in dense pine (Youmans 1982). White-tailed deer tend to remain in one particular area and do not migrate in the winter (Hamlin 1978).

The one bighorn sheep herd in the Resource Area is located in the Powder River Breaks near Locate; they remain in an area of approximately 50 square miles. A minimum population of 75 sheep is believed to occupy this range (Dood 1982).

Game Birds

Sage grouse, sharp-tailed grouse, ring-necked pheasants and Merriam's turkey are the primary upland game birds in the Resource Area. Important use areas for grouse are the leks (display/mating areas), nesting areas and wintering areas. Sage grouse are almost totally dependent on sagebrush for food and cover (Wallestad 1975), while sharp-tailed grouse utilize a variety of habitats, especially prairie grasslands interspersed with brushy draws and scattered stands of Ponderosa pine (Swenson 1977, 1978; Econ 1977). Merriam's turkeys are dependent upon Ponderosa pine stands, but do utilize wheat fields and ranch yards when winter snow covers other available food sources (Jonas 1966). Ring-necked pheasants are found primarily along the riparian bottoms where agricultural practices provide food and riparian vegetation provides essential cover. Some Hungarian partridge are found in close association with scattered agricultural lands.

Waterfowl production is keyed to scattered suitable sites. Rivers, perennial streams, and stock ponds provide a variety of nesting habitats.

The State of Montana plans to initiate a mourning dove hunting season in 1984. BLM stock ponds, reservoirs, water distribution systems and stock tanks all provide necessary scattered watering sites for doves.

Other Sensitive Species

Some of the migratory birds of high federal interest and state species of special interest or concern that have been identified in the region include the ferruginous hawk, merlin, golden eagle, prairie falcon, upland sandpiper, burrowing owl and black-tailed prairie dog. The ferruginous hawk and merlin are closely associated with grassland and sagebrush-grassland, while the upland sandpiper prefers grassland. The golden eagle nests in either trees or cliff sites, while prairie falcons prefer to nest in cliff sites. Burrowing owls are most often associated with prairie dog towns, as they require burrows dug by burrowing mammals for nesting. Prairie dog towns occur throughout the area and furnish habitat and food for birds and animals dependent on them.

Most small mammals in the region occupy ponderosa pine and upland shrub habitats, with fewer species occurring in grasslands. Songbirds occupy all habitats. Riparian zones support the greatest number and diversity of species followed, in order, by ponderosa pine, sagebrush, and grassland habitats (Consol 1981; Martin 1980; Mikol 1977).

In cooperation with range resource personnel, each of the 642 allotments has been categorized into the M, I and C classifications. Table 3-16 integrates all the available wildlife data into the allotment categorization.

All activity planning is closely coordinated between range and wildlife personnel.

Bird ramps are installed in stock tanks as new water sources are developed for livestock. These ramps are escape platforms which allow small animals that fall into the tanks to climb out.

Bird nesting boxes are installed as appropriate sites are identified. Although bluebirds and kestrels have been the main species involved, wood duck boxes are being added to the program.

Goose nesting platforms have been constructed. They are installed on stock ponds as suitable sites are identified. This program is coordinated with the Montana Department of Fish, Wildlife and Parks. Islands are constructed in stock ponds to provide secure nesting sites for waterfowl and to supplement the goose platforms.

Livestock exclosures may be installed around new reservoir developments to protect these new wetlands from damage by livestock. A tank, water gap or other means of livestock access to water is provided in these cases.

Aquatic Wildlife

Rivers, streams and reservoirs throughout the Resource Area provide sport fishing and important fish habitat. Table 3-17 lists ratings of streams for fish in the region.

TABLE 3-16
NUMBER AND PERCENTAGE OF ALLOTMENTS WITH WILDLIFE CONCERNS

Categories	C	M	I	Totals
No. of Allotments	369	174	99	642
No. with major wildlife concerns/ conflicts	60 (16%)	91 (52%)	63 (64%)	214 (33%)
No. with little or minor wildlife concerns	209 (57%)	30 (17%)	11 (11%)	25 (39%)
No. needing further survey prior to wildlife classification	100 (27%)	53 (31%)	25 (25%)	178 (28%)
No. with major wildlife concerns requiring further survey (included above)	2	6	6	14

TABLE 3-17
MONTANA DEPARTMENT OF FISH, WILDLIFE & PARKS STREAM FISHERY EVALUATION (1980)

Water Name	Upper Boundary	Lower Boundary	Tributary to	Resource Value
Hanging Woman Creek	MT-WY Border	Mouth	Tongue River	2
Little Powder River	MT-WY Border	Mouth	Powder River	3
Lonetree Creek	Natural Corral	Airport	Yellowstone River	3
Mizpah Creek	Sand Creek	Mouth	Powder River	3
Otter Creek	Bear Creek	Mouth	Tongue River	3
Powder River	MT-WY Border	Mouth	Yellowstone River	2
Pumpkin Creek	Tongue R. Road Bridge	Mouth	Tongue River	3
Pumpkin Creek	First Creek	Tongue River Road Bridge	Tongue River	3
Sarpy Creek	Reservation Boundary	Mouth	Yellowstone River	2
Tongue River 01	T & Y Dam	Mouth	Yellowstone River	2
Tongue River 01	Beaver Creek	T & Y Dam	Yellowstone River	3
Tongue River 02	River Leaves Indian Res.	Beaver Creek	Yellowstone River	2
Tongue River	River Enters Indian Res.	River Leaves Indian	Yellowstone River	3
Tongue River	Tongue River Reservoir	River Enters Indian	Yellowstone River	3
Tongue River 03	MT-Wy Border	Tongue River Dam	Yellowstone River	3
Yellowstone River 02-01	Cartersville Diversion	Powder River	Missouri River	1
Yellowstone River 02-02	Bighorn River	Cartersville Diversion	Missouri River	2
Rosebud Creek	Creek Enters Reservation	Mouth	Yellowstone River	3
Rosebud Creek	N & S Forks Rosebud Ck.	Indian Reservation	Yellowstone River	3

Rating Definitions
1 = Highest-value fisheries resource
2 = High-priority fisheries resource
3 = Substantial fisheries resource
4 = Limited fisheries resource

Walleye, sauger, shovelnose sturgeon, channel catfish, burbot, smallmouth bass, and a variety of nongame fish spawn in the streams and rivers. Pallid sturgeon and paddlefish may also spawn in the Yellowstone River (Elser, personal communication). Rainbow trout, largemouth and smallmouth bass, and northern pike are the most common fish available in ponds.

There are four ponds on public land which are stocked for public fishing. Both new and old ponds are evaluated each year for inclusion in the stocking program. Elser, et al (1981) described the distribution of all the fish species in streams.

Cultural Resources

Cultural resource inventories show more than 1,765 prehistoric and historic sites in southeastern Montana. A survey of 51,860 acres or 4.8% of the public surface ownership has located 270 sites. Another 238,540 acres of private land over federal minerals have been inventoried and 950 sites have been located. BLM has some measure of responsibility for 73% of the recorded sites in southeastern Montana.

Cultural sites document human history in the area from about 12,000 years ago to the present. The Early or Paleoindian period dates from about 10,000 to 6,000 years B.C. The Middle or Archaic period is thought to date from 6,000 B.C. to A.D. 400. The Late Prehistoric period began about A.D. 400 with the adoption of the bow and arrow, and continued until the acquisition of the horse and European trade goods, about A.D. 1750.

Prehistoric sites are represented by quarries, lithic scatters, campsites, tipi rings, rockshelters, kill sites and buffalo jumps, cairns and rock art. The historic period is represented by the remains of dugouts, cabins, sheepherders' monuments, battlefields, trails and roads. The significance of such sites is determined by the amount and integrity of the information preserved in them, and by the importance of the historic or prehistoric events which occurred there.

Two sites with BLM involvement are presently listed on the National Register of Historic Places, the Rosebud Battlefield area and Slim Kobold Buffalo Jump. A total of 57 sites of all periods, including the Reynolds Battlefield, have been determined eligible to the National Register, while over 200 sites await a determination of eligibility.

Paleontologic Resources

Legal protection of paleontologic material extends only to those fossils deemed significant (Antiquities Act of 1906, 16 USC 432, 433). Under present usage, vertebrate fossils are usually the only significant, therefore regulated, fossils. Removal of significant fossils from public land is authorized by Antiquities Act Permits.

The Hell Creek formation is the most significant formation in the region, due to the amount and kind of fossils it contains. It has produced dinosaur and early mammal fossils known worldwide including six of the seven known Tyrannosaurus specimens.

Localities and specimens are recorded as they are found by Antiquities Act permittees and BLM personnel using a locality form and cataloging system.

Wilderness

Diversity in the National Wilderness Preservation System (As of 3/83)

Ecotype/Landform

The Bailey-Kuchler system was used to classify all existing and potential units of the National Wilderness Preservation System (NWPS) into ecotype/landform types. It can be determined, using this classification, whether a potential unit could expand the ecotype/landform diversity of the NWPS.

Both the Zook Creek WSA and the Buffalo Creek WSA are in Bailey-Kuchler Ecoregion 3110 subgroup 15. This is the Great Plains shortgrass prairie ecoregion and eastern ponderosa pine subgroup.

There are no representatives in the NWPS of this subgroup. There is one representative in units endorsed by the President and pending before Congress. There are two potential representations, i.e. those included in this plan. See Appendix M.

Proximity to Population Centers

There are two standard metropolitan statistical areas (SMSAs) identified by the U.S. Bureau of the Census within five hours driving time of Zook Creek WSA and Buffalo Creek WSA. Billings, Montana has a population of 66,800 and Casper, Wyoming has a population of 51,046 (1980 census).

Billings and Casper are within five hours driving time of abundant and diverse wilderness areas. There are 11 wilderness areas of approximately 3.5 million acres within five hours driving time of Billings. There are 18 wilderness areas of approximately 4.0 million acres within five hours driving time of Casper(Appendix M).

There are 37 administratively endorsed areas of approximately 3.5 million acres within five hours driving time of Billings. There are 35 administratively endorsed areas of approximately 3.7 million acres within five hours driving time of Casper. The two SMSAs are close to abundant wilderness and potential wilderness resources (Appendix M).

There are 82 other study areas of approximately 2.2 million acres within a five-hour driving time of Billings. There are 72 other study areas of approximately 1.5 million acres within five hours driving time of Casper (Appendix M).

Geographic Distribution

Appendix M lists all existing and potential wildernesses, by status and agency, within Montana.

ZOOK CREEK WILDERNESS STUDY AREA (MT-027-701)

Size

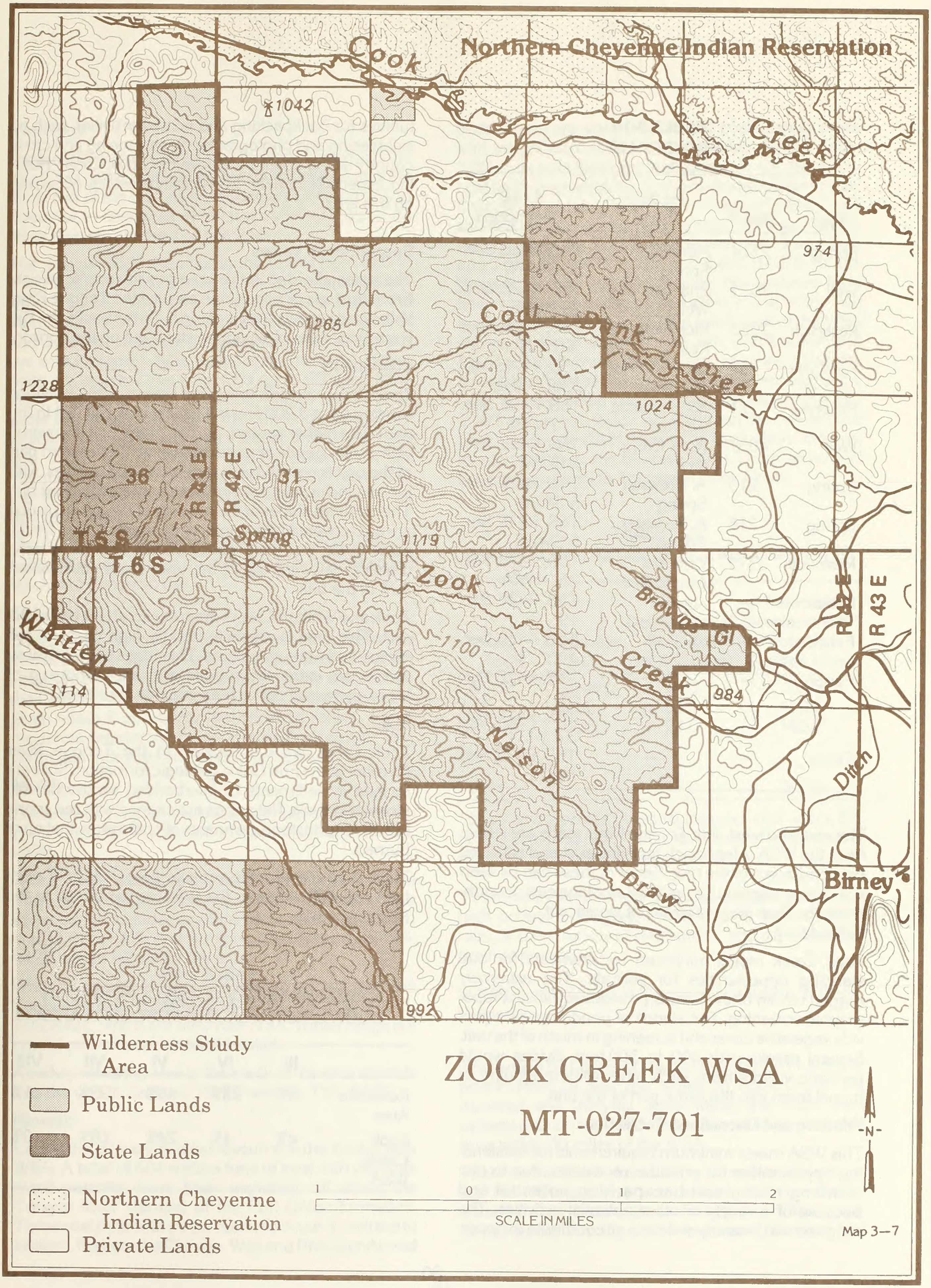
The Zook Creek Wilderness Study Area (WSA) is located 26 miles southwest of Ashland in Rosebud County. It consists of approximately 8,438 acres. The WSA is a mile west of the Tongue River and just south of the Northern Cheyenne Indian Reservation. The unit is bounded by private and state lands, except for one mile in the southwest. There the boundary separates public land, judged not to have wilderness characteristics during inventory, from the WSA. The unit is approximately 3-1/2 miles square. See Map 3-7.

Naturalness

Nearly all of Zook Creek appears natural. There are several minor developments, but they are screened by vegetation and topography. A majority of these developments are along the edges of the unit. There are three miles of vehicle ways in the unit. A faint vehicle way enters the unit in T6S, R42E, Section 2 and ends at a windmill. There is a vehicle way in Sections 4 and 5 of T6S, R42E. Another vehicle way in T5S, R42E, Section 28 goes to a windmill in Section 29.

A new reservoir was constructed during 1979 at the site of an older reservoir in T5S, R42E, Section 30. The old reservoir is silted in and the area is heavily vegetated. The replacement reservoir disturbs the immediate area of this rough drainage. A vehicle way extends for one mile into the unit to this reservoir site.

There are four other small reservoirs, three developed springs and two wells in the unit, along with seven miles of fence. See Table 3-18.



ZOOK CREEK WSA

MT-027-701

Map 3—7

TABLE 3-18
PROJECT LIST

Type	JDR #	Project Name	Legal Description
Spring	2114	Moreland Spring	T5S, R42E Sec. 30 SWNW
Well	7025	2nd Two-Way Well	T5S, R42E Sec. 29 NESE
Reservoir	7068	Rice Draw #2 Res.	T5S, R42E Sec. 30 NENW
Reservoir	67	Brown Cattle Co. Res.	T5S, R42E Sec. 33 E1/2NE
Reservoir	111	Brown Cattle Co. Res.	T6S, R42E Sec. 11 NWNE
Well	4057	Zook Creek Well	T6S, R42E Sec. 2 SESW
Spring	210	A. Brewster Spring	T6S, R42E Sec. 5 SESW
Spring	216	A. Brewster Spring #2	T6S, R42E Sec. 5 SWSE
Reservoir	1375	Brewster Arnold Res.	T5S, R41E Sec. 25 NWSW
Fence	—	—	T5S, R42E Sec. 19
Fence	—	—	T5S, R42E Sec. 29,31,32
Fence	—	—	T5S, R42E Sec. 31 T6S, R42E Sec. 3,4,10,11
Fence	—	—	T6S, R42E Sec. Sec. 5

The east and west side Tongue River roads are visible from the WSA. Also, ranch facilities exist and activities occur adjacent to the unit. Some of these can be seen from some ridges in the unit while looking east or north. However, their magnitude is not significant.

Solitude

Zook Creek meets minimum requirements for outstanding opportunities for solitude. The extremely rugged terrain of the breaks provides significant topographic screening. The stands of ponderosa pine provide vegetative cover and screening in much of the unit. Several creeks with 400 to 500-foot divides would separate visitors from each other without tending to funnel them into the same part of the unit.

Primitive and Unconfined Recreation

This WSA meets minimum requirements for outstanding opportunities for primitive recreation, due to outstanding hiking and backpacking potential and because of a variety of other potential activities. The rough terrain, scenery and trees all contribute to opportunities for backpacking and related activities such as sightseeing and photography. Snowshoeing and cross country skiing could be enjoyed in Zook Creek. Hunting, especially for deer, is an activity presently occurring on this area.

Supplemental Values

The vistas afforded in this area provide scenic values. From the tops of ridges, one can see the Tongue River Valley and rugged breaks along it. To the south, the Big Horn Mountains of Wyoming stand out on the horizon.

Topography

Zook Creek consists of rugged breaks, with elevations ranging from 3,200 feet in the east to 4,100 feet in the west. The higher western portion of the unit is covered with dense stands of ponderosa pine. The eastern part of the unit is covered with sagebrush and grasses, with juniper and ponderosa pine trees scattered throughout. The northern slopes of the majority of breaks in the unit are also covered with stands of ponderosa pine. Deciduous trees, including cottonwoods, line the creeks draining eastward out of the unit. Trees cover about 40% of the unit.

Zook and Whitten Creeks drain the southern half of the unit. This area is characterized by high bluffs of red clinker and white sandstone. The ridges between these creeks are extremely rugged and are composed of loose, rocky soil cut by frequent side drainages.

Soils

Zook Creek WSA is located in the Tongue River Member of the Fort Union geologic formation. Soils are formed in sediments of interbedded sandstone, siltstone and shale. Ridgetops are capped with red scoria or baked sandstone, remnants of coal seams that once burned.

Table 3-19 displays the acreage percentages of each land capability class in the WSA as compared to the Resource Area.

TABLE 3-19
LAND CAPABILITY CLASS COMPARISON
ZOOK CREEK WSA AND RESOURCE AREA

	III	IV	VI	VII	VIII
Resource Area	8%	23%	45%	23%	1%
Zook Creek WSA	4%	4%	24%	68%	0%

Hydrology

Zook and Whitten Creeks and Nelson Draw drain the south half of the unit, while Coal Bank Creek drains the north half of the unit. All are ephemeral, flowing only in response to snowmelt or intense summer storms. All drain directly into the Tongue River.

The Tongue River Member in the unit is from 500 to 1500 feet thick and serves as an important groundwater source. Sandstone and coal beds within the Member are the major aquifers, although yields to stock and domestic wells are generally less than 20 gallons per minute (gpm). Where saturated, fractured clinker beds are aquifers and may yield up to 65 gpm. However, 10 gpm is more common. Shales do not yield water and locally may cause the unit to function hydrologically as a confining layer (Stoner and Lewis 1980 and Lewis and Hotchkiss 1981). Water from the Member ranges in TDS from 500 to 2,000 mg/l, making it adequate for stock but marginal to unfit for domestic use.

The Tullock and Fox Hills-Lower Hell Creek aquifers lie below the unit, but at depths generally too deep for stock and domestic use.

Air Quality

Background concentrations of constituents presented in this chapter are believed to be characteristic of the existing situation for the wilderness study area. Under the Clean Air Act (as amended 1977), these lands were given Class II air quality classification, which allows moderate deterioration associated with moderate, well-controlled industrial and population growth.

Wildlife

There are two known sharp-tailed grouse leks within the Zook Creek Unit. They are in Sections 4 and 9, T6S, R42E.

Winter range crucial to the continued survival of local mule deer populations is found within this area. This winter range includes portions of Sections 29, 30, 31, and 32, T5S, R42E and Sections 3,4,5,8,9 and 10, T6S, R42E, which fall within the area.

White-tailed deer winter range extending uphill from the Tongue River includes parts of Sections 1, 2, 10 and 11, T6S, R42E, which are within the WSA. Winter range is a crucial part of local whitetail habitat.

A turkey wintering area to the north of the area extends into the unit in Sections 19, 29 and 30, T5S, R42E.

Minerals

Coal is the primary mineral resource in the Zook Creek WSA. A total of 464 million tons of coal with development potential have been identified, all within the Tongue River Member of the Fort Union formation. Three coal beds with major reserves occur. From top to bottom, they are the Canyon, Wall and Brewster-Arnold beds. There are several additional coal-bearing zones with insignificant reserves at strippable depths. Table 3-20 shows thicknesses and tonnages for the major coal beds. In general, the coal is ranked subbituminous. Core samples taken within three miles of Zook Creek showed average as-received values of 4.9% ash, 0.29% sulfur, and 8,957 BTU/lb for the Wall bed (3 samples) and 7.5% ash, 0.40% sulfur, and 8,444 BTU/lb for the Brewster-Arnold bed (1 sample). No analyses have been made of the Canyon bed close to the WSA. Two analyses of the Canyon bed ten miles west of the WSA showed average values of 4.7% ash, 0.31% sulfur, and 8,418 BTU/lb. Analyses of four samples from the Brewster-Arnold bed several miles south and east of the WSA showed better quality values (average 5.1% ash, 0.40% sulfur, and 9,022 BTU/lb) than the one sample near the WSA. (BLM Resource Evaluation, Billings, Montana; Matson and Blumer, 1973). There are no coal leases or exploration licenses in Zook Creek.

TABLE 3-20
MAJOR COAL DEPOSITS IN ZOOK CREEK WSA

Coal Bed	Thickness (ft)	High Development* Potential (million tons)	Moderate Development** Potential (million tons)
Canyon	12 (avg)	10.0	32.6
Wall	22-36	83.8	150.8
Brewster-Arnold	16-26	24.0	163.2
Total		117.8	346.6

* High development potential includes coal with a 6:1 or less stripping ratio, 200 feet or less of overburden, and a thickness of five feet or greater.

**Moderate development potential includes coal in the high potential category, with a 15:1 or less stripping ratio, 500 feet or less of overburden, and a thickness of five feet or greater.

SOURCE: McKay BLM Resource Evaluation, Billings, Montana.

There are 5,831 acres of pre-FLPMA and 1,971 acres of post-FLPMA oil and gas leases in Zook Creek. Six hundred and thirty-six acres within the WSA were unleased as of July 1983. There are no oil or gas fields in or within 30 miles of the WSA.

There are no known locatable or other leasable minerals. No mining claims are present. Known saleable minerals are clinker and sand and gravel. Clinker produced by the burning of the Anderson-Dietz coal bed forms the plateau covering the highest elevations in the WSA. Smaller clinkered areas mark the outcrops of lower coal zones. Approximately 1,500 to 2,000 acres in the WSA are covered by clinker. Insignificant deposits of sand and gravel occur along the floors of the major drainages.

Industry submitted nine Energy and Minerals Resource Evaluation Assessment forms for the Zook Creek WSA. In general, the forms indicated high coal potential. One respondent suggested there was moderate to good oil and gas potential in the Muddy formation, as indicated by oil shows to the southwest of the WSA; anticlines and faults observed by photo-interpretation in the region also suggested oil and gas potential. Another respondent commented that the area was largely unexplored for Pennsylvanian and older oil potential. There was little interest in other minerals, although clinker and gravel were mentioned in passing.

A draft report of the contracted Tongue River Geology, Energy, and Mineral Resource Assessment (Tetra Tech 1983) was examined. Because of its general nature, it was of little value. Additional updated site-specific information for Zook Creek was compiled by BLM mineral specialists.

Timber

Zook Creek is well forested with ponderosa pine. The ponderosa pine stands are concentrated on the plateau in the northern portion of the unit. There are sparser stands on the north slopes of the upper reaches of Zook Creek and draws of Whitten Creek.

Approximately 5,400 acres (64%) of the 8,440 acres in the WSA were included in the BLM inventory as forest land. Of the 5,400 acres, 502 acres (9.3%) were classified as noncommercial. Another 2,823 acres (52.3%) were classified as reproduction, some of which may be commercial forest land. The remaining 2,075 acres of forested land was classified as commercial forest land. This is 38% of the forested land and 25% of the WSA. The standing gross volume is approximately 3.3 million board feet.

Range Vegetation

There are three livestock operators with portions of their allotments in the WSA. These allotments are tentatively categorized in the "M" category. See Table 3-21.

TABLE 3-21
RANGE ALLOTMENTS IN ZOOK CREEK WSA

		Public Lands			
Allotment Number	Total Ranch AUMs[1]	Total BLM AUMs	Acres	WSA BLM AUM	Acres
3358	3,960	188	1,686	182	1,651
3362	1,000	17	295	0	0
3363	4,400	513	4,762	403	3,451
3380	8,000	1,018	7,197	498	3,338
TOTAL	17,360	1,736	13,340	1,083	8,440

[1] Includes everything within operator's ranch.

Cultural Resources

No prehistoric or historic sites are presently recorded in the area, nor have any inventories been conducted in the unit. However, reconnaissance near the boundaries and inventory nearby indicate that the Zook Creek area has high potential for significant archaeological and historical sites. Types of sites likely to be present would include porcellanite quarries and workshops, campsites and occupations.

Projected Visitor Trends

It is estimated that 25 visitor days per year of offroad vehicle use occur. This use is expected to continue under existing management.

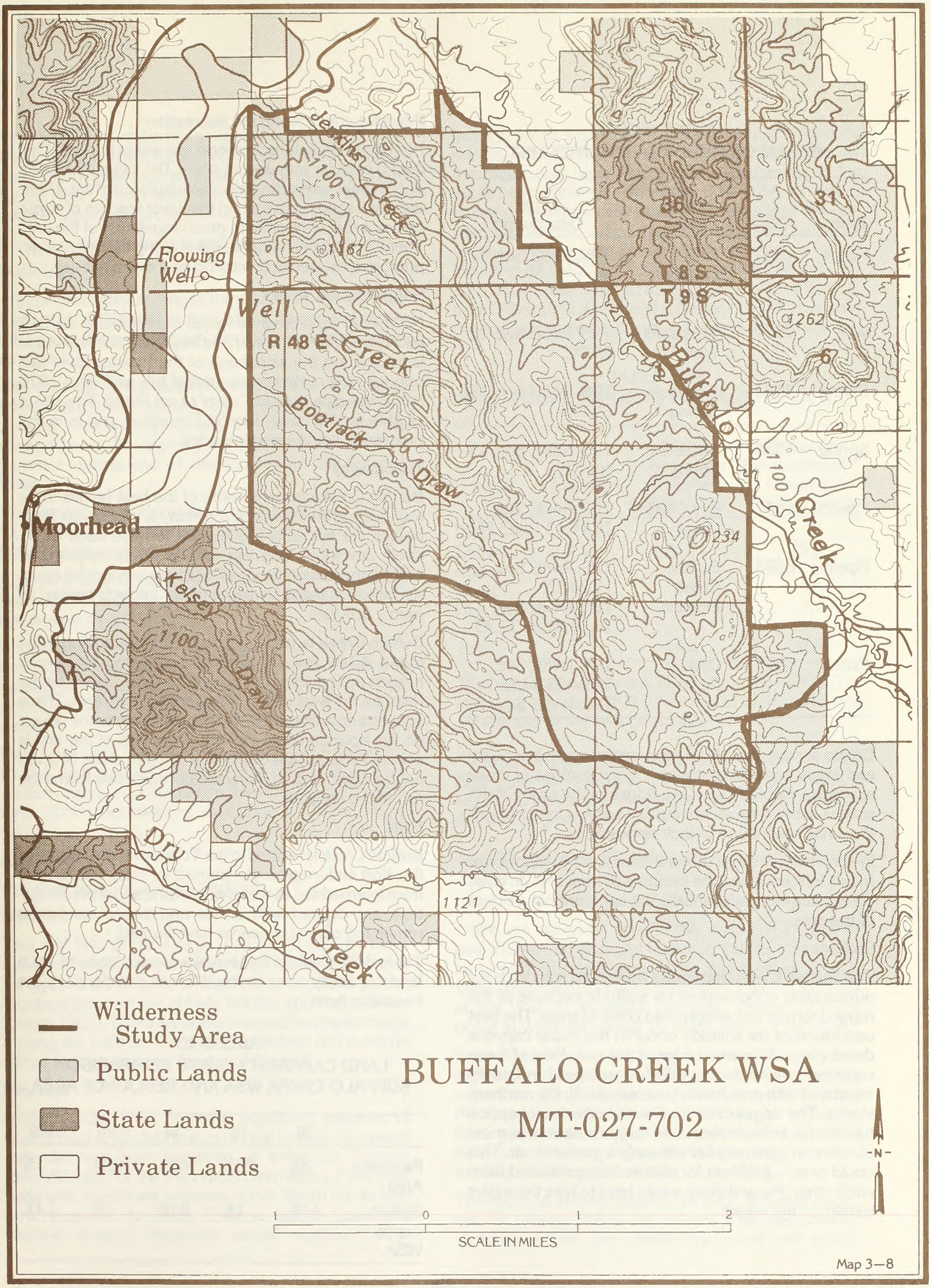
BUFFALO CREEK WILDERNESS STUDY AREA(MT-027-702)

Size

The WSA contains approximately 5,650 acres. It is located approximately 35 miles southwest of Broadus and five miles north of the Montana-Wyoming stateline. It is just east of the Powder River. The WSA is rectangular in shape. It is approximately 2.5 miles wide (east-west) and 3.5 miles long. It is bounded exclusively by roads along the south boundary. The remainder of the boundary is private land or short sections of roads (either Buffalo Creek or east Powder River). See Map 3-8.

Naturalness

Almost all of the human improvements occur on the ridge tops, especially in the southern portion of the unit. There are about seven miles of fence in the unit. The most obvious section of fence is one that runs north along the highest ridge from the southeast corner of Section 24, T9S, R48E. A pipeline and associated stockwater tanks are the next most obvious signs of man, although the pipeline itself is almost invisible. The only evidences of the pipeline are the tanks and the pipeline drains. Two very small reservoirs are located along the east boundary and are hard to see from even a short distance away. A windmill is located in the northeast part of T9S, R48E, Section 12. A vehicle way exists in Section 35, T9S, R48E, and Sections 2 and 11 of T9S, R48E. There are several springs in the unit. See Table 3-22.



BUFFALO CREEK WSA
MT-027-702

Map 3—8

TABLE 3-22
BUFFALO CREEK WSA PROJECT LIST

Type	JDR #	Project Name	Legal Description
Fence	C411	E&E Simpson Fence	T9S, R48E Sec. 11, 14
Well	2571	Simpsons Well #1	T9S, R48E Sec. 12 SWNE
Spring	4084	Simpsons Spring	T9S, R48E Sec. 13 SWNE
Spring	4086	Three Bar Spring	T9S, R48E Sec. 13 NWNE
Pipeline	6697	Dry Creek Pipeline	T9S, R48E Sec. 10,11,13,14,23,26
Pipeline	6698	Buffalo Creek Pipeline	T9S, R48E Sec. 13,24,25 T9S, R49E Sec. 18,19,29,30,32,33
Fence	6827	Drybo Fence	T9S, R48E Sec. 13,14,23,24,26 T9S, R49E Sec. 18

Offsite scenes include oil pads on the south boundary and roads adjacent to the boundary. Portions of those roads are visible from a few ridges in the unit. Offsite scenes are not significant due to their low frequency or the small magnitude of their appearance.

In summary, most of the unit contains no evidence of man's influence and the imprints of man that do exist, do not degrade substantially the apparent naturalness of the area.

Solitude

The Buffalo Creek Unit meets minimum standards for outstanding opportunities for solitude because of the rugged terrain and widespread cover of trees. The best opportunities for solitude occur in the many canyons developing off the main ridge in this unit. Most of these canyons have numerous side drainages and are heavily vegetated with ponderosa pine, especially the northern slopes. The ridges in the unit would offer lesser opportunities for solitude, because they are narrow in most places and generally flat with only a grassy cover. This could pose a problem for visitors being shielded from each other. Many visitors might tend to hike the easier terrain on the ridges.

Primitive and Unconfined Recreation

Hunting is the only recreational use within the unit. This area is popular with deer hunters. The rugged canyons would make interesting places to explore on foot. There are a few sandstone walls in the lower reaches of some canyons that contrast with green vegetation of the unit. There is potential for horse travel along the open ridge, photography, geologic viewing and overnight use.

Supplemental Values

No special supplemental values were noted at the Buffalo Creek WSA. However, the Reynolds' Battlefield site is located on the west bank of the Powder River just opposite the northwestern part of this unit. This 1876 battle was a prelude to Custer's Last Stand. This site is eligible for National Historic Site status and is in the process of being recommended.

Topography

Buffalo Creek contains some of the best breaks to be found along the Powder River. Many of the Powder River breaks are evidently too rugged to have been extensively developed and this area is no exception. The overall impression is one of relatively untouched country, although there are some minor impacts caused by man's activities.

Buffalo Creek consists of a north-south trending ridge about 4,100 feet in elevation, dissected by several rugged drainages which run off the ridge to the Powder River on the west and Buffalo Creek on the east. These canyons drop about 600 feet from the rim to the valleys on the boundaries of the unit. Over 50% of the unit is covered with ponderosa pine with open areas of grass on the ridge tops. In many areas, red clinker forms the rim of the canyons.

Soils

Buffalo Creek is located in the Tongue River Member of the Fort Union geologic formation. Soils are formed from interbedded sandstone, siltstone and shale. Ridgetops are capped with scoria and baked sandstone remaining after coal seams have burned.

Table 3-23 displays the acreage percentages of each land capability class in the WSA as compared to the Resource Area.

TABLE 3-23
LAND CAPABILITY CLASS COMPARISON
BUFFALO CREEK WSA AND RESOURCE AREA

	III	IV	VI	VII	VIII
Resource Area	8%	23%	45%	23%	1%
Buffalo Creek WSA	11%	1%	84%	0%	4%

The distribution of the percentages varies significantly. Class III and IV types for the WSA are less than 40% of that for the Resource Area. Class VI is the dominant type for the WSA. This makes the WSA most suitable for wildlife, watershed protection and grazing uses.

Erosion potentials for this area are moderate to high.

Hydrology

Annual precipitation ranges from 12 to 16 inches, with a snowfall of 35 to 50 inches. About 75 percent of the total precipitation falls from April through September as rainfall.

The east half of the Buffalo Creek Unit is drained by tributaries of Buffalo Creek. The west half is drained by Jenkins, Well, and Dry Creeks, and Bootjack Draw. All are ephemeral, flowing only in response to snowmelt or summer storms and all are tributary to the Powder River.

The Tongue River Member in the unit contains several localized aquifers, however, they are generally too deep for domestic and stock use.

A pipeline originating at a well on Dry Creek outside the unit supplies some water for livestock in the unit. There are several small springs.

Snowmelt and rainfall generally percolate into numerous exposed clinker beds and reappear as seeps and springs where the base of these beds crop out. This action tends to reduce and prolong surface runoff peaks.

Data from wells in the Tongue River Member adjacent to the unit typically revealed the predominance of sodium, calcium, magnesium, bicarbonate and sulfate ions. TDS concentrations were about 4000 mg/l (Lee 1979).

Air Quality

See the Zook Creek WSA Section.

Wildlife

This unit falls within a large area which has not been surveyed for deer and antelope use. However, the unit is recognized as an area of high mule deer use by the Montana Department of Fish, Wildlife and Parks (Steve Knapp 1983). There are some unidentified raptor nests among the cliffs on the northeast border and a prairie falcon nest on the east border of the unit.

Minerals

Buffalo Creek WSA contains significant reserves of coal. A total of 55 million tons of coal with development potential have been identified, all within the Tongue River Member of the Fort Union formation. Four coal beds with significant reserves occur. From top to bottom, they are the Dietz, Canyon, Upper Cook and Number 5 beds. There are several additional coal-bearing zones with insignificant reserves at strippable depths. Table 3-24 shows thicknesses and tonnages for the major coal beds. There are no coal analyses for these beds within several miles of the WSA. However, based on analyses of these and other beds in the surrounding region, the coal is ranked lignitic to subbituminous. Values can generally be expected to range from 4 to 8% ash, 0.2 to 0.5% sulfur, and 7,200 to 7,900 BTU/lb on an as-received basis (BLM Resource Evaluation, Billings, MT; Matson and Blumer 1973). There are no coal leases nor exploration licenses in the WSA.

TABLE 3-24
MAJOR COAL DEPOSITS BUFFALO CREEK WSA

Coal Bed	Thickness (ft)	High Development* Potential (million tons)	Moderate Development** Potential (million tons)
Dietz	15	3.2	0
Canyon	9-13	20.7	25.2
Upper Cook	5	1.2	0.6
Number 5	6-7	1.3	2.7
Total		26.4	28.5

*High development potential includes coal with a 6:1 or less stripping ration, 200 feet or less of overburden, and a thickness of five feet or greater.

**Moderate development potential includes coal in the high potential category, with a 15:1 or less stripping ratio, 500 feet or less of overburden, and a thickness of five feet or greater.

SOURCE: McKay, BLM Resource Evaluation, Billing, Montana.

There are no acres pre-FLPMA and 5,012 acres of post-FLPMA oil and gas leases in Buffalo Creek. Six hundred thirty-eight acres were unleased as of July 1983. There are no oil or gas fields in or within 15 miles of the WSA in Montana. However, several oil fields occur in Wyoming about 10 miles south of the WSA.

Seismic exploration has been active in the vicinity during the past few years. In 1982, one shot hole line was run across the WSA. Because of the steep slopes and the requirement not to impair wilderness suitability, helicopters instead of trucks were used to provide access. In 1983, one vibroseis traverse was run on an existing road along the border of the WSA.

There are no known locatable or other leasable minerals. No mining claims are present. The only saleable minerals known are clinker and sand and gravel.

Clinker produced by the burning of the Dietz and Canyon beds covers about 600 to 1,000 acres. Clinker produced by other beds covers insignificant areas. Insignificant deposits of sand and gravel occur along the floors of the major drainages.

Industry submitted six Energy and Minerals Resource Evaluation Assessment forms for the Buffalo Creek WSA. Respondents generally indicated high coal potential and moderate to high oil and gas potential. One respondent commented that Buffalo Creek lies along the Minnelusa trend, which has had some recent oil discoveries in Wyoming, just south of the state line. Because there are no Minnelusa tests in the vicinity of the WSA, the respondent predicted that the area would have considerable exploration interest in the near future. There was little interest in other minerals, although gravel was mentioned in passing.

A draft report of the contracted Moorhead Geology, Energy, and Mineral Resource Assessment (Tetra Tech 1983) was examined. Because of its general nature, additional updated site-specific information for Buffalo Creek was compiled by BLM mineral specialists.

Timber

The Buffalo Creek WSA is sparsely forested with ponderosa pine. The stands occur on north aspect slopes on tributary drainages of the Powder River, Bootjack Draw, Well Creek, and Jenkins Creek to the west and unnamed tributary drainages of Buffalo Creek to the east.

Approximately 3,622 acres (64.1%) of the 5,650-acre WSA were included in the 1965 BLM inventory as forest land. However, 3,089.6 acres (85.2%) were classified as noncommercial forest land. Another 279.4 acres (7.7%) were classified as reproduction, some of which may be commercial forest land. The remaining 253 acres of forested land were classified as commercial. This is 7.0% of the forested land and 4.5% of the WSA. The standing gross volume is approximately 0.5 million board feet.

Range Vegetation

There is one operator who grazes livestock within the WSA. His allotment is tentatively categorized in the "I" (Improve) category. See Table 3-25.

Cultural Resources

Approximately 960 acres or 17% of the Buffalo Creek WSA have been surveyed for cultural resources. Three sites were located during the 1983 East Powder River survey, while two more are not yet recorded. The sites are four lithic scatters and a cabin structure. The diverse environmental zones suggest the area has high potential for cultural resources. Other types of sites likely to be present include porcellanite quarries, campsites and possibly rock art.

Projected Visitor Trends

It is estimated that 150 visitor days per year of recreational use occur. This is associated with the hunter access program and is likely to continue.

TABLE 3-25
RANGE ALLOTMENTS IN BUFFALO CREEK WSA

		Public Lands			
		Total		WSA	
Allotment Number	Total Ranch AUMs*	BLM AUMs	Acres	BLM AUMs	Acres
3782	12,000	1,163	6,575	0	0
3879	12,660	2,939	13,652	1,108	5,650
TOTAL	24,660	4,102	20,227	1,108	5,650

*Includes everything within operator's ranch.

Lands

There are 1,080,675 acres of public surface estate and 4,103,700 acres of subsurface mineral estate under BLM administration, which includes 563,000 acres of subsurface mineral estate within the Custer National Forest. The lands lie within six counties: Custer, Big Horn, Carter, Powder River, Rosebud and Treasure. There are 523,415 acres (48%) of surface lands which are isolated and have no legal access. This results from undesirable areas being unwanted during the homesteading period of the late 1800's and early 1900's.

Table 3-26 shows BLM administered surface, subsurface and percent of access per county.

TABLE 3-26
BLM ADMINISTERED SURFACE, SUBSURFACE AND PERCENT OF ACCESS

County	Surface Acres	Percent of Access	Subsurface Acres
Carter	511,159	76	1,191,100
Custer	186,958	7	478,900
Big Horn	27,017	21	372,100
Powder River	261,523	50	1,496,740
Rosebud	82,131	22	539,560
Treasure	11,887	10	25,300
Totals	1,080,675	(52)	4,103,700

The fragmented surface and split surface/mineral estate ownership pattern of the public land presents numerous management problems and often restricts use by the public. Adjustment of the land pattern could increase the management efficiency of federal resources in certain situations and provide legal access to isolated tracts for use by the public for recreation or other purposes.

Acquisition of Howrey Island near Myers, Treasure County, during 1983 has resulted in 595 acres acquired through the exchange pooling process.

Other land pattern adjustment programs include the acquisition of 1,800 acres near Moorhead by transfer from the Bureau of Reclamation.

A Forest Service—BLM boundary adjustment is in the proposal stage and is a feasible opportunity in the future.

Current sales, exchanges and acquisitions are being considered as a result of management direction and public need and to resolve unauthorized uses on public lands.

The development of energy may create new or expand existing communities, resulting in an increased demand for public lands for a variety of uses such as recreation and public purposes, industrial or agricultural.

Current land withdrawals include approximately 2,700 acres for power site purposes, primarily in the Moorhead area. These withdrawals are expected to be revoked in the near future. Those federal lands withdrawn for Custer National Forest are expected to continue. Approximately 55,000 acres, formerly the Fort Keogh Military Reservation, were transferred by Act of Congress on April 15, 1924, to the Department of Agriculture with reversion to the Department of Interior of any portions not needed or used for livestock or forage experiments.

There are approximately 12 rights-of-way cases per year. Most right-of-way applications are for new construction of rural electric and telephone lines or amendments to existing rights-of-way.

Other rights-of-way requests are for roads, transmission lines and other facilities related to coal mining activities.

Due to the land ownership pattern in coal development areas, few major rights-of-way cross public land and those that do, cross only a small area. As a result, rights-of-way corridors across public lands have not been a major concern.

Recreation

Located within the Resource Area's boundaries are the Ashland and portions of the Sioux Districts of the Custer National Forest, the Northern Cheyenne Indian Reservation, the Tongue River Reservoir, and the Powder, Tongue, Little Missouri and Yellowstone Rivers. These areas offer a variety of dispersed recreational opportunities including fishing, photography, boating, hiking, rock collecting, sightseeing, hunting, and ORV use. Table 3-27 shows estimated visitor days.

Hunting, the most popular type of recreation, consists primarily of big game and upland birds with limited waterfowl hunting. In 1978, the five ranches involved in the Resource Area's hunter access program had 160 hunters. In 1982, they had 393 hunters.

The hunter access program consists of cooperative agreements with ranchers to open private lands to hunting in return for closing certain public lands which are being used by livestock.

The Tongue River Reservoir, located in the southwest section of the resource area is a major recreation site for fishing and boating. As shown in Table 3-28, fishing in this reservoir has increased during the past few years. This increase in recreation pressure can be attributed to coal development in this general area. Proportional increases in use on ponds and streams on public lands can be expected.

The area has scenic areas and sites having local and state historic significance. The scenic areas are located near the major river drainages and the two districts of the Custer National Forest. However, much of the scenic areas and those areas having local historic values are either privately owned or have no legal access. Of the 1,080,675 acres of land administered by the BLM, only 523,415 acres or 48% of the total acreage has legal access. This situation has resulted in additional recreational pressure on surrounding private and public lands.

Air Quality

The Federal Environmental Protection Agency (EPA) assigns air quality classifications to indicate allowable increments of degradation from the desired air quality. Class I, Class II, and Class III designations allow progressively greater increments of consumption. Essentially all of the Resource Area is rated Class II. The Northern Cheyenne Indian Reservation is rated Class I. Although TSP and SO_2 are the major pollutants of concern, background concentrations for the region are quite low. Approximately 126 square miles around the town of Colstrip have been assigned a nonattainment status for total suspended particulates. The State Implementation Plan has included procedures for achieving an attainment status and the area is anticipated to be in compliance in the near future. The only designated impact area is around Colstrip power plant Units 3 and 4 and consequently, it is the only place in the Resource Area that will be consuming increments of pollution above background levels. The impact area is for SO_2 only. Concentrations of SO_3 from Units 3 and 4 will be about 18 micrograms per cubic meter (ug/m^3) at a distance of 16 miles south and southeast from the stacks and about 25.6 ug/m^3 at a distance of 7.5 miles southeast of the stacks.

Forestry

The forest resource is generally scattered throughout the Resource Area and is generally managed for wildlife habitat and watershed. Only on an incidental basis are forestry products harvested. Uses are normally for posts and poles, Christmas trees and firewood. Three forest types exist: ponderosa pine, juniper and cottonwood. The ponderosa pine occur as fragile sparse stands on south slopes and somewhat more productive, vigorous, and dense stands on north slopes. These occur most frequently on the upper (southern) drainages of the Powder, Tongue and Little Missouri Rivers and the lower divide between the Tongue and Powder. Juniper are found in pure stands on drier sites and are mixed with Ponderosa pine throughout the area.

Cottonwood and green ash occur exclusively on riparian sites. Cottonwood is the predominant hardwood species in both size and abundance. Green ash is a highly-valued native hardwood found mostly on privately owned lands (but reaches limited size). Of the 134,252 acres of public forest land approximately 48,400 acres (36%) are commercial. Of the commercial acreage, 29,040 (60%) are poorly stocked.

Agriculture

Agriculture is considered the number one industry in Montana. There are 8,253,936 acres of land in the Resource Area as shown in Table 3-29. Rangeland used for the production of livestock composes approximately 85 percent and seven percent is utilized for the production of crops. Much of the private lands overlie federal minerals.

TABLE 3-27
RECREATION VISITOR DAYS (Thousands)[1]

Location	1972-76	1977	1978	1979	1980	1981	1982
Custer National Forest Ashland-Ft. Howes Districts	26.1 (avg)	43.8	41.4	37.7	43.7	47.3	—
Custer National Forest Sioux District	31.8 (avg)	40.3	37.7	45.4	36.0	42.2	—
Northern Cheyenne Indian Reservation[2]	—	—	—	—	1.25	4.0	—
Powder River Resource Area Hunting (big game)[3]	—	—	—	29.9	28.7	26.9	—
Hunting (waterfowl)	—	5.49	4.01	—	—	—	—
Hunting (upland birds - excluding turkeys)	—	—	—	15.7	13.7	—	—
State Park Sites (Memorial Day through September 30)[4]	—	—	—	—	68.5	127.4	174.

[1] Visitor Day — the presence of one or more persons on an area of land or water for the purpose of engaging in one or more recreation activities during continuous, intermittent or simultaneous periods of time aggregating twelve hours

[2] Involves Northern Cheyenne Tribal members only

[3] Includes the entire Resource Area

[4] Visitation at Powder River Resource Area sites administered by the Montana Department of Fish, Wildlife and Parks

SOURCE: U.S. Forest Service, Custer National Forest; Bureau of Indian Affairs, Northern Cheyenne Agency; State of Montana, Department of Fish, Wildlife and Parks

TABLE 3-28
ESTIMATED NUMBERS OF FISHERMAN HOURS (STANDARD DEVIATIONS*) SPENT AT THE TONGUE RIVER RESERVOIR FROM JUNE - SEPTEMBER 1975, 1976 and 1981

Month	1975		1976		1981	
	Weekends[1]	Weekdays	Weekends	Weekdays	Weekends	Weekdays
June	1,064 (247.4)	431 (242.5)	4,264 (1093.0)	2,009 (827.0)	1,865 (297.1)	660 (358.0)
July	1,595 (259.3)	572 (94.4)	929 (392.1)	1,848 (664.8)	1,448 (276.2)	499 (136.3)
August	992 (210.0)	312 (155.0)	623 (171.9)	475 (130.8)	1,437 (272.9)	368 (101.7)
September	1,150 (300.0)	419 (120.0)	2,312 (1026.0)	1,190 (383.0)	1,018 (456.2)	582 (107.6)
Subtotals	4,801 (512.4)	1,806 (325.8)	8,128 (1559.0)	5,522 (1135.6)	5,676 (668.7)	2,108 (410.7)
Yearly Totals	6,607 (607.2)		13,650 (1,928.7)		7,875 (784.8)	

[1] Includes holidays

The Creel Census on Northern Pike from the Tongue River Reservoir for June - September, 1981 by William R. Gould, Allen A. Elser and Robert C. McFarland

*A measure of the range above and below the average.

TABLE 3-29
ACRES AND PERCENT OF EACH COUNTY WITHIN THE RESOURCE AREA

County	Acres in the County	Within the Resource Area Acres	Percent
Big Horn	3,235,200	368,640	11.4
Carter	2,120,320	2,112,640	99.6
Custer	2,409,600	1,520,640	63.1
Powder River	2,110,656	2,110,656	100.0
Rosebud	3,220,480	1,497,600	48.5
Treasure	636,080	636,080	100.0
TOTAL	13,732,336	8,246,256	

Pulbic lands are predominately utilized as rangeland, except for very small areas used for agriculture or hay cutting. State of Montana lands leased to individual ranchers may be utilized as cropland if suitable for cropping. Private land consists of approximately 70 percent in the Resource Area and has approximately 82 percent rangeland and nine percent cropland. Three classes of cropland are considered: nonirrigated, irrigated, and hay and tame pasture. Nonirrigated cropland is used primarily to produce cereal grains under an alternate crop-fallow system. Hay and tame pasture consists of tame grasses and legumes used to supplement livestock feed. Irrigated cropland includes lands which have a season-long supply of irrigation water available. These lands are used to produce a number of crops, primarily small grains, corn, and hay. Other crops include relatively small acreages of sugar beets, dry beans, sunflower speltz, sorghum and safflower.

The acreages of individual crops vary from year to year, depending on the market and weather outlook during the crop year.

Dryland crop yields vary considerably from year to year, due to precipitation variations and temperature. Low rainfall received at the right time, coupled with cool temperature, can produce comparable yields of crops equal to years having five to seven inches more rainfall.

Conversely, years having normal precipitation (6 to 15 inches), may produce poor yields if the moisture falls as a series of light showers. Hail storms and high winds are also a problem. Nearly every year some part of the area receives considerable hail damage.

Table 3-30 shows the estimated variability of crop yields over a period of years.

Table 3-31 shows the crops and acreages seeded and harvested during crop year 1981. There have also been small acreages of durum wheat, sunflower and safflower planted. Approximately 40,678 acres of cropland overlie areas of federal coal with development potential that have passed through the surface owner and unsuitability screens. Table 3-32 shows the estimated yield on the 40,678 acres for five different crops.

Prime farmland is defined as having the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops and is also available for these uses. Prime farmland could be cropland, pastureland, rangeland, forestland, or other land,

TABLE 3-30
VARIABILITY ESTIMATES OF CROP YIELDS

Growing Season	1981*	1980*	1977*	1974*
Precipitation (inches)	9.35	7.41	9.40	10.94
Total Acres Harvested (Nonirrigated)	342,495	236,017	284,375	285,069
Total Acres Harvested (Irrigated)	65,967	79,776	70,760	72,759
Winter Wheat (Bu/Ac) (Nonirrigated)	29.2	17.8	25.1	31.0
Winter Wheat (Bu/Ac) (Irrigated)	47.8	45.6	37.3	38.5
Spring Wheat (Bu/Ac) (Nonirrigated)	19.2	16.5	22.1	16.7
Spring Wheat (Bu/Ac) (Irrigated)	55.2	49.5	45.3	54.0
Barley (Bu/Ac) (Nonirrigated)	29.3	21.8	30.6	26.5
Barley (Bu/Ac) (Irrigated)	65.8	48.2	56.1	60.0
Oats (Bu/Ac) (Nonirrigated)	34.5	34.5	28.2	34.0
Oats (Bu/Ac) (Irrigated)	72.4	65.8	80.1	51.3
All Hay (Tons/Ac) (Nonirrigated)	1.4	1.1	1.2	1.1
All Hay (Tons/Ac) (Irrigated)	3.0	2.8	2.5	2.6
Alfalfa (Tons/Ac) (Nonirrigated)	1.6	1.1	1.4	1.3
Alfalfa (Tons/Ac) (Irrigated)	3.3	3.0	2.8	3.2

*Source: Montana Agricultural Statistics

TABLE 3-31
CROPS AND ESTIMATED ACREAGES HARVESTED IN 1981

Crop	Acres Seeded	Acres Harvested		Average Yield*	
		Nonirr	Irr	Nonirr	Irr
Winter Wheat	146,912	127,697	596	26.8 bu/A	45.7 bu/A
Spring Wheat	28,881	24,991	2,465	19.8 bu/A	49.2 bu/A
Barley	33,958	25,270	4,239	29.0 bu/A	58.5 bu/A
Oats	20,657	5,651	1,244	36.4 bu/A	65.3 bu/A
Hay (grass-legume)	67,910	48,635	19,275	1.3 ton/A	2.7 ton/A
Hay (alfalfa)	122,667	80,353	42,314	1.4 ton/A	3.0 ton/A
Corn (silage)	11,707	719	10,264	5.6 ton/A	17.5 ton/A
Corn (grain)	2,342	—	2,342	—	76.7 bu/A
Beans	1,816	—	1,753	—	16.4 CWT/A
Sugar Beets	4,575	—	4,555	—	21.5 ton/A

Source: Montana Agricultural Statistics
*Average yield developed from Montana Agricultural Statistics for years 1974 thru 1981 (8 year average).

but not urban or water built up land. It has soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. In general, prime farmlands have an adequate and dependable water supply from irrigation, a favorable temperature and growing season, acceptable salt or sodium content, and few if any rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period, and they either are not flooded frequently or are protected from flooding.

The Resource Area has 127 soils that are classified as prime farmlands, if irrigated. This farmland has the same characteristics as prime farmland, but lacks irrigation water or adequate moisture needed to produce sustained high yields of crops.

There are also 195 soils that are of statewide importance for cropland. This is dry or irrigated farmland, in addition to prime farmland, that is of statewide importance for production of food, feed, fiber, forage, and oilseed crops. Appropriate state agencies have outlined the criteria for defining this land. Generally, this farmland includes those that are nearly prime and that economically produce high yields of crops when treated

TABLE 3-34
CATTLE AND CALF INVENTORY AND SALES (1978)

State or County	Inventory*	Percent	No. Sold	Value of Sales	Percent of State Sales
MONTANA	2,820,065	100.00	1,757,482	597,904,000	100.00
Big Horn	15,948	.57	9,007	3,326,700	.51
Carter	57,004	2.02	34,490	11,325,000	1.96
Custer	58,373	2.07	38,213	13,393,250	2.17
Powder River	74,825	2.65	39,815	14,106,000	2.27
Rosebud	48,942	1.74	29,893	11,069,760	1.70
Treasure	26,264	.93	15,137	4,967,000	.86
Totals	281,356	9.98	166,555	58,187,710	9.48

*See Table 3-29.
Source: 1978 Census of Agriculture, U.S. Department of Commerce, Washington, D.C. 1981.

TABLE 3-35
SHEEP AND WOOL SALES (1978)

State or County	No. Ranches	Value of Sales	Percent of State Sales
MONTANA		$ 22,622,000	100.0
Big Horn	9	28,650	0.1
Carter	108	3,089,940	13.8
Custer	36	354,900	1.6
Powder River	53	944,000	4.2
Rosebud	12	241,280	1.1
Treasure	2	—	—
	220	$ 4,658,770	20.8

TABLE 3-36
WHEAT FOR GRAIN PRODUCTION (1978)

State or County	No. Ranches*	Acres*	Percent of State	Quantity* (bu.)	Percent of State
MONTANA	10,749	4,807,895	100.00	134,505,058	100.00
Big Horn	29	11,222	.23	345,457	.26
Carter	120	36,375	.76	798,047	.59
Custer	75	19,733	.41	453,197	.34
Powder River	111	30,573	.64	852,473	.63
Rosebud	55	31,697	.66	990,652	.74
Treasure	31	6,043	.13	181,531	.13
Totals	471	135,643	2.83	3,621,357	2.69

*See Table 3-29.
Source: 1978 Census of Agriculture, U.S. Department of Commerce, Washington, D.C. 1981.

and managed according to acceptable farming methods. Some may produce yields as high as prime farmland, if conditions are favorable. This farmland has deep soil (more than 40 inches to limiting material) with slopes of less than 10 percent and on which conservation practices relatively easy to apply can effectively control erosion. This farmland has a capability class III or better, an exchangeable sodium percentage of less than 15, and an electrical conductivity of less than four in the top two feet and less than ten from two to four feet below the surface.

TABLE 3-32
ESTIMATED YIELD FOR CROPS ON 40,678 ACRES OVER COAL WITH DEVELOPMENT POTENTIAL

Crop	Estimated Yield*
Winter Wheat	1,090,170 bushels
Spring Wheat	805,424 bushels
Barley	1,179,662 bushels
Oats	1,480,679 bushels
Hay (All)	52,881 tons
Alfalfa Hay	56,949 tons

*Yield based on 100% of land planted to each individual crop under nonirrigated conditions.

Economics

Agricultural Economics

In Montana, agriculture makes a large contribution to the total economy. In 1978, there were 24,469 farms and ranches. Of this total, 81.3% were individually or family owned. Farms totaled more than 62 million acres. Of this total, 8.8 million acres were cropland (14%). Wheat was the predominant crop, which utilized 4.8 million acres or 54.6% of the total cropland acreage. Farmers produced 134.5 million bushels of wheat valued at $376,614,000. Hay was grown on 2.36 million acres and produced 4.4 million tons. This crop is used primarily for winter feed for cattle. The inventory of cattle fluctuates, depending on market conditions and weather (drought). In 1978, the total inventory of cattle and calves was 2.8 million. A total of 1.7 million cattle were sold for $570,707,000. The total sales of all agricultural products in Montana for 1978 was $1,184,000,000.

Table 3-33 shows the counties or partial counties that have lands within the Resource Area. Figures for counties partially within the Resource Area have been computed on a percentage of the total county. In comparing average size of each ranch to the state's average size, it can be seen that ranches are much larger in this area. Also, the percentage of land area used for ranching is also greater that the state's average.

Cattle inventories and sales are shown in Table 2-34. Total inventory of cattle and calves and sales for each county or partial county are depicted. These figures show that approximately 9.98% of the state's total cattle are raised and 9.74% are sold from this area.

The Resource Area supports approximately 22% of the sheep produced in the state. The sales associated with sheep production are 20.7% of the state total (Table 3-35).

Wheat production figures are shown in Table 3-36. The Resource Area contains approximately 2.8% of the state's wheat acreage and produces 2.69% of the state total.

Table 3-37 shows that total agricultural sales for these counties or partial counties is 6.9% of the state's total. This table also shows that the county average income from each ranch is greater than the state average.

Ranch-Related Economic Conditions

In 1978 there were 1,238 ranches within the borders of the resource area (Census of Agriculture, USDA 1980). Some 84% of the 8.25 million acres are used for ranching. About 1,792 acres are used by 82% of the ranches to grow crops (Table 3-33). The 1,080,675 acres of public land in the Resource Area constitutes 15% of the lands there. The AUMs provided by public land amounts to 6% of the total provided by all lands.

TABLE 3-33
ACRES IN RANCH (1978)

State or County	No. Ranches	Ranch Acreage*	Ranch Avg. per County	Proportion of Co. in Ranches by %
MONTANA	24,469	62,269,824	2,545	66.8
Big Horn	75	317,030	4,227	86.0
Carter	345	1,566,916	4,542	73.9
Custer	245	1,430,922	5,840	94.1
Powder River	346	1,578,771	4,563	74.8
Rosebud	182	1,425,715	7,834	95.2
Treasure	112	605,548	5,407	95.2
TOTALS	1,304	6,924,902	5,311 (Average)	83.90

*See Table 3-29 for acreage in the county.

Source: 1978 Census of Agriculture, U.S. Department of Commerce, Washington, D.C. 1981.

Table 3-38 estimates rancher incomes in four general ranch sizes. It shows the estimated ranch returns above cash costs, including debt service, minus depreciation by ranch size. This amount is available to the livestock operators and their families for their labor and management and return to equity capital. Returns from each category of ranch were estimated by formulating a budget for a representative ranch for each of the size categories. See Appendix N.

TABLE 3-37
ALL AGRICULTURAL PRODUCT SALES (1978)

State or County	Agricuture Product Sales*	Percent of State Sales*	County Average Sales Per Ranch
MONTANA	$ 1,184,000,000	100.00	$ 48,412
Big Horn	5,058,300	.43	67,988
Carter	17,475,000	1.48	50,651
Custer	16,890,250	1.43	69,110
Powder River	18,831,000	1.60	54,426
Rosebud	15,078,440	1.27	82,850
Treasure	8,140,000	.68	72,676
Totals	$ 81,472,990	6.89 (Average)	$ 66,283

*See Table 3-29.
Source: 1978 Census of Agriculture, U.S. Department of Commerce, Washington, D.C. 1981.

On the basis of 1977-79 average prices, the representative ranch in each size and type category earns enough income to at least cover cash costs and depreciation Table 3-38. Average returns of $5,636 annually for the small livestock operation are not enough to pay the operator minimal wages or a return to equity capital. (See Appendix O.) Some of these operators and their families are employed off the ranch to supplement their incomes.

If they do not have off-ranch employment and the returns are not enough to cover family living expenses, they usually allocate funds from the depreciation allowance, at least in the short term. If this happens, the operators must live with deteriorating equipment.

Public land is an economic factor to these ranches and enables many of them to remain in existence.

The average ranch is 29% dependent upon public land to support the ranch operations. See Table 3-39. Generally, the smaller ranches are relatively more dependent on BLM than are the larger ones.

Permit Value

The BLM does not recognize the right of the operator to treat his BLM grazing preference as real property. However, these preferenced AUMS do have value.

The value of the preference varies considerably. If the preference is for small, isolated, landlocked tracts of public lands, the value is minor. Where public lands provide a large block of grazing, the preference value can be substantial. Preference value is difficult to estimate because it usually is not separated from the total value of the ranch. Ranches are usually valued and sold

TABLE 3-38
ESTIMATED RANCH INCOME BY RANCH SIZE (1983)

Ranch Size Category (Acres)	Ranches With BLM Permits in Res. Area		Number of Cows	Average Number BLM AUMs Per Ranch	Livestock Enterprise Average* Per Ranch (1980 Dollars)
	No.	%			
Small 0-6,250	120	44	1-100	234	$ 5,636
Medium 6,251-15,500	89	33	101-250	578	$ 18,567
Large 15,501-31,150	50	18	251-500	1,064	$ 40,776
Very Large 31,151 and up	14	5	501 and up	1,609	$ 107,141

*Sales minus costs minus depreciation equals livestock enterprise average per ranch.
Sources: BLM 1983; ASCS 1980

TABLE 3-40
COVERED EMPLOYMENT AND SALARIES AND WAGES FOR 1980

(salaries and wages are in millions of dollars)

County/Sector	Employment[1]	Salaries and Wages
Big Horn County		
Coal employment[2]	954	26.8
Construction employment[3],[4]	589	17.3
All other employment[3]	2,351	25.4
All covered employment	3,894	69.6
Powder River County		
Coal employment[2]	15	0.3
Construction employment[3],[4]	33	0.5
All other employment	529	5.8
All covered employment	577	6.6
Rosebud County		
Coal employment[2]	432	12.1
Construction employment[3],[4]	707	14.9
All other employment[3]	2,337	23.3
All covered employment	3,476	50.3

NOTE: Totals may not agree due to rounding.

[1] The 1980 employment is the annual average of monthly employment covered by unemployment insurance, as reported for the county of employment. The 1980 salaries and wages are a summation of covered quarterly salaries and wages. Monthly and quarterly data for 1980 were furnished by the Employment Security Division of the Montana Department of Labor and Industry.

[2] The 1980 coal employment is an estimate derived from covered mining employment on the basis of the amount of coal activity compared to other mining activity in the county. Salaries and wages for coal are based on the 1980 weekly average wage for mining.

[3] Salaries and wages are projected on the basis of 1980 average weekly wages.

[4] Construction estimates for major projects were obtained from industrial planning and environmental impact statements.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

on a cost-unit basis. It is estimated that an average value for the BLM grazing preference is approximately $100 per AUM or $1,200 per animal unit. The average preference values for the different size ranches are as follows:

Small—$23,400
Medium—$57,800
Large—$106,400
Very Large—$160,900

Coal

In 1980, coal mining provided 1,401 jobs in Big Horn, Rosebud and Powder River Counties. See Table 3-40. This employment provided approximately $39 million to the regional economy. These employment figures were used to develop ratios of employment to population used in the Casper District office input-output model.

Many of these workers in Montana reside in Sheridan County, Wyoming. This county receives no impact funds from Montana. Secondary employment is induced into Sheridan County by these Montana workers (Tables 3-40 and 3-41).

Population and housing for these counties, the Northern Cheyenne and Crow Reservations and Sheridan County, Wyoming, are displayed in Tables 3-42, 43, and 44.

The levels of community services in the Resource Area are displayed in Tables 3-45 and 46.

Expenditures are displayed in Tables 3-47, and 48. These figures were used to determine projections for future coal development on a per capita basis. This indicates that communities, counties, schools and Indian tribes are capable of raising sufficient funds to meet these needed expenditures. The counties, schools, and communities off the reservations are able to develop revenues by taxation, user fees, grants or debt. The Indian tribes do not have the opportunity of raising revenues through taxes. They do have some resources (grazing and timber) that provide some revenues. Federal funds have been diminishing in recent years, which has brought about the reduction of some services to the Indians.

Coal Taxes

The 1975 Montana Legislature enacted the highest severance tax in the nation—30% of the mine-mouth price for subbituminous coal and 20% for lignite (Montana Coal Council). In 1982, Montana collected $80,475,459. Table 3-49 shows the distribution of this severance tax money. One-half is being set aside as a trust fund for future generations' use. The impact fund (8.5%) is used to assist areas impacted from coal development. This money is distributed by the Montana Coal Board upon application. Communities must demonstrate that they are impacted and have exhausted all avenues (i.e. raising local taxes or selling bonds) to be eligible for these funds. In some cases, they may receive a grant and in other cases they may be required to provide matching funds.

The 1983 Montana State Legislature approved a bill which allows Indian tribes to compete with state agencies for loans and grants. The Coal Board is authorized to use 7% of the 8.5% impact funds received for these agencies and Indian tribes. These funds must be applied for.

All nonrenewable resource producers are required to pay a Resource Indemnity Trust Tax of 0.5% of the gross value of their production to the State of Montana.

There are additional taxes paid to the counties on the value of coal operations. These are gross proceeds taxes and property taxes on the mine equipment. The millage collected is different for each county and this money goes to the county where the coal is mined and not to the impacted communities.

TABLE 3-39
ESTIMATED RANCH DEPENDENCY ON BLM LAND (1983)

Ranch Size Category	Ranches In Category	Number of Ranches in Each Category of Dependency: 0-15%	16-30%	31-45%	46-99%	Average Percent Dependency
Small 0-6,250 acres	120	4 (3%)	38 (32%)	49 (41%)	29 (24%)	36%
Medium 6,251-15,550	89	2 (2%)	39 (44%)	31 (35%)	17 (19%)	33%
Large 15,501-31,150	50	10 (20%)	18 (36%)	16 (32%)	6 (12%)	29%
Very Large 31,150 and up	14	6 (43%)	5 (36%)	3 (21%)	—	18%

Source: BLM 1983

TABLE 3-41
COVERED EMPLOYMENT AND SALARIES AND WAGES FOR 1980 FOR SHERIDAN COUNTY
(salaries and wages are in millions of dollars)

County/Sector	Employment[1]	Salaries and Wages
Secondary employment induced in Sheridan County by Montana employment[2]	70	0.8
Montana workers residing in Sheridan County[3]	490	13.8

NOTE: Except as noted, 1980 figures are actual data as reported by the Wyoming Employment Security Commission (WESC).

[1] Salary and wage based on 1980 average weekly wages published by the WESC.

[2] Estimate of employment induced in Sheridan County by primary employment in neighboring Montana counties. Because covered employment is reported by county of employment, these numbers are included in Sheridan County employment.

[3] Industrial estimates of the number of Big Horn County coal mine employees living in Sheridan County in 1982 were 50.89% of estimated 1982 coal employment in Big Horn County. That percentage was used to estimate the number of persons employed in Big Horn County who might reside in Sheridan County. Because covered employment is reported by county of employment, these numbers are included in Big Horn County and Powder River County employment.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 3-42
POPULATION AND HOUSING FOR 1980

County/Sector	Population	Housing Units
Big Horn County	11,096	3,867
Crow Reservation Div.	1,234	5,645
Hardin Division	4,249	1,737
Hardin	3,300	1,360
Northern Cheyenne Div.	1,013	288
Tongue River Division	189	108
Powder River County	2,520	1,123
Broadus Division	1,321	612
Broadus	715	337
East Powder River Div.	725	303
Otter Division	474	208
Rosebud County	9,899	3,787
Ashland Division	564	248
Ashland[1],[2]	415	128
Forsyth Division	3,516	1,472
Forsyth	2,553	1,053
Northern Cheyenne Div.	2,651	758
Rosebud Division	3,168	1,309
Colstrip	1,476	475

NOTE: Figures for 1980 are from the actual census count, except where otherwise noted. Totals may not agree due to rounding.

[1] Not to be confused with the Ashland District of the Northern Cheyenne Reservation.
[2] Figure for 1980 is an estimate from the Miles City District, BLM

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 3-43
POPULATION AND HOUSING IN 1980 FOR SHERIDAN COUNTY

County/Sector	Population	Housing
Primary impact of Montana employment	1,410	620
Secondary impact of Montana employment	190	80
Base without Montana impacts[1]	23,500	10,300
County Total	25,048	10,928

[1] Base population and housing were derived by subtracting primary and secondary impacts from the total.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

Each miner pays the Montana personal income tax, including approximately 50% in the Resource Area who work in Montana and live in Sheridan County, Wyoming. Montana does not contribute any of the taxes received to this county (Montana Coal Council).

Montana surface mines pay a tax to the state for abandoned mine reclamation. This tax amounts to 10% of the FOB mine price up to a maximum of 10 cents per ton on lignite or 35 cents per ton for all other types of coal.

Also, 2% of the FOB mine price or 25 cents per ton, whichever is less, is paid to a fund for black lung disease victims, even though this disease is primarily suffered by underground miners (Montana Coal Council 1983).

Royalties are a monetary payment to the coal owner, not a tax on the realized profits. Owners include private people (fee), federal and state governments and Indian tribes. Fifty percent of federal royalties are returned to the state.

Taxes paid from coal development provide a large contribution to the State of Montana. In addition, Rosebud and Big Horn Counties have received taxes which have enabled the counties to cope with impacts from coal development and still have some of the lowest tax rates in the state.

For example, the net (prior to 1975) and gross proceeds taxes paid on the value of the coal to support county government in Big Horn and Rosebud Counties, where the mines are located, are shown in Table 3-50. (Source—Montana Coal Council).

TABLE 3-44
POPULATION AND HOUSING IN 1980 FOR THE CROW AND NORTHERN CHEYENNE INDIAN RESERVATIONS

	Population	Housing Units
Crow Reservation		
Indian	3,953	801
Non-Indian	2,020	1,038
Reservation total[1]	5,973	1,830
Lodge Grass	771	215
Northern Cheyenne Reservation		
Indian	3,101	718
Non-Indian	563	328
Reservation total	3,664	1,046
Ashland (on reservation)[2]	380	110
Birney (on reservation)[2]	145	40
Busby[2]	810	230
Lame Deer[2]	2,000	570

NOTE: Totals may not agree due to rounding. Figures for 1980 are from actual census count except as noted.

[1] Includes the portion of the Crow Reservation in Yellowstone County, Montana.

[2] Population figures for Ashland, Birney, Busby, and Lame Deer were taken from statements of members of the Northern Cheyenne Tribe at the EIS scoping meeting in Ashland, Montana, on May 26, 1983. Housing figures are based on the average number of persons per house for the Northern Cheyenne Reservation.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 3-45
LEVELS OF COMMUNITY SERVICES 1979-1980

County/ Community	School Enrollment	Water Capacity (million gallons per day)	Sewage Capacity (million gallons per day)	Law Enforcement (sworn officers)	Firefighters		Hospital Beds
					Full-time	Volunteers	
Big Horn	2,393	—	—	16	—	23	50
Hardin	—	4.0	b	c	—	20	—
Powder River	580	—	—	4	—	15	—
Broadus	—	0.5	e	c	—	f	—
Rosebud	2,536	—	—	19	—	—	26
Ashland	—	g	g	c	—	—	—
Colstrip	—	h	i	c	—	27	—
Forsyth	—	3.5	0.5	c	—	16	—

a. A 36-bed nursing home and a 20-unit retirement home were to be opened in 1983.
b. Hardin has sufficient capacity to accommodate a community of 6,000 persons.
c. Community law enforcement is provided by the county.
d. Based on three wells and pumping capacity of 345 gallons per minute.
e. Broadus has a three-cell lagoon of 7.72 acres. Only one cell is in use at present.
f. Firefighting services provided by the county.
g. Sewage and water systems were built in 1980 to accommodate a community of 2,500 persons.
h. Considered adequate for peak population of 7,200 (Mont. DSL and U.S. OSM, DEIS for Rosebud Mine, 1983).
i. Adequate to service 7,500 persons.

SOURCES: Miles City District, BLM; Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 3-46
LEVELS OF COMMUNITY SERVICES IN 1979-1980 ON THE CROW AND NORTHERN CHEYENNE INDIAN RESERVATIONS

Reservation/ Comm.	School Enrollment	Water Capacity (million gallons per day)	Sewage Capacity (million gallons per day)	Law Enforcement (sworn officers)	Firefighters		Hospital Beds
					Full-time	Volunteers	
Crow Reservation	[1]	—	—	15	6[2]	—	—
Crow Agency	[1]	900[3]	17	12	—	10	34
Lodge Grass	[1]	274[3]	12	2		10	
Northern Cheyenne Reservation	[1]	—	—	15	6[4]	—	—
Ashland (on reservation)	420	72[3]	4	—	—	—	—
Birney (on reservation)	[1]	72[3]	2	—	—	—	—
Busby	218	144[3]	3	—	—	—	—
Lame Deer	[1]	360[3]	10	—	—	—	[5]

SOURCES: Miles City District, BLM; Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

[1] Public schools are operated by the county. Enrollment levels for Big Horn and Rosebud Counties are presented in Table 3-45.

[2] Part-time firefighters employed by the Bureau of Indian Affairs, U.S. Department of the Interior.

[3] Water capacities are based on 625 gallons per minute (gpm) pumping capacity for Crow Agency, 190 gpm for Lodge Grass, 50 gpm for Ashland, 50 gpm for Birney, 100 gpm for Busby, and 250 gpm for Lame Deer.

[4] In addition, there is a seven-member forest crew during the summer.

[5] At present Lame Deer has an outpatient clinic, four doctors, and three ambulances.

TABLE 3-47
LOCAL EXPENDITURE LEVELS IN THE NORTHERN POWDER RIVER REGION IN 1980[1]
(in thousands of dollars)

Big Horn County	6,109.5
Schools	9,892.3
Hardin	778.1
Powder River County	3,887.5
Schools	2,025.8
Broadus	162.3
Rosebud County	6,392.5
Schools	5,911.7
Ashland[2]	—
Colstrip	4,813.1
Forsyth	1,341.0

[1] Actual expenditures reported by local entities. Includes debt servicing.

[2] Ashland had no formal budgeting in 1980.

SOURCE: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 3-48
LOCAL EXPENDITURE LEVELS IN 1980 ON THE CROW AND NORTHERN CHEYENNE INDIAN RESERVATIONS
(in thousands of dollars)

Crow Reservation	6,474.8
Lodge Grass*	87.0
Northern Cheyenne Reservation	4,235.2

*Lodge Grass is an incorporated town.

SOURCE: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 3-49
MONTANA COAL SEVERANCE TAX DISTRIBUTION AS OF DECEMBER 1982

	Percent
Trust Fund	50.00
General Fund	19.00
Education Trust Fund*	10.00
Fund Impact Area	8.75
School Equalization	5.00
Parks, Art and Aesthetics	2.50
Alternate Energy	2.25
Renewable Resources	1.25
Land Use Planning	0.50
State Library	0.50
Conservation District	0.25
	100.00

*Interest from the trust funds divided as follows:

School Equalization	67.5
Board of Regents	22.5
Public School and University Trust Fund	10.0
	100.0

SOURCE: Montana Coal Board, Helena.

TABLE 3-50
GROSS PROCEEDS TAXES PAID FOR SUPPORT OF COUNTY GOVERNMENT

		Period of Time
Big Horn County		
Decker Coal Company	$ 23,878,830	1972 - 1982
Spring Creek Coal	1,879.633	1981 - 1982
	$ 25,758,463	
Rosebud County		
Peabody Coal Company	$ 4,905,708	1969 - 1982
Western Energy Company	18,355,456	1969 - 1982
	$ 49,019,627	

Source: Montana Coal 1983, Montana Coal Council, 1983

Social Conditions

Population Trends

Table 3-51 shows county population trends in the Resource Area. Two counties within the Resource Area have shown a positive net in-migration over the last 10 years. The construction of power plants at Colstrip and mining of coal has caused this increase in Rosebud County. A small increase in Custer County can be attributed to the growth of Miles City as a trade center. Big Horn County has had a great deal of energy development, but has had out-migration at the same time. This is due to miners living in Sheridan, Wyoming, rather than in the sparsely populated southern portion of Big Horn County. Carter, Powder River and Treasure Counties show an out-migration of population.

Table 3-52 presents objective indicators of social well-being by county. These southeastern Montana counties share rural characteristics of an agriculturally based history. The counties can be differentiated somewhat in terms of a rural and urban split. Custer County population is predominantly urban, due to the importance of Miles City as a trade and service center. Rosebud and Big Horn Counties have an increasing urban population as well, due primarily to coal mining. Powder River, Carter and Treasure Counties are categorized as 100% rural.

In addition to the urban influence, Big Horn and Rosebud Counties have a substantial Native American population from the Northern Cheyenne and Crow Tribal reservations. Table 3-53 shows social well-being by race in these two counties.

Both Big Horn and Rosebud Counties have a significantly higher percentage of population under 17 than either the state average or other counties in the Resource Area. Looking at Table 3-53, it is the Native American population in the counties that generally accounts for this demographic profile. Having more population under 17 can cause socioeconomic strain due to dependency drains on services and productivity. As shown in Table 3-53, Indian unemployment rates are considerably higher than those for whites. In comparing Tables 3-51 and 3-53, it is clear that the Native Americans in the Resource Area are a disadvantaged group economically and in terms of education and health care.

While the demographic profile in Big Horn and Rosebud Counties concentrates population in the younger age bracket, the opposite profile appears in Carter and Treasure Counties. In these counties, there is a higher proportion of population over 65 than the state average. This reflects that agriculture operators are tending to be in the older age categories. The counties with nonagricultural employment opportunities are losing population due to out-migration. This is happening in Powder River, Treasure and Carter Counties.

Two indicators of social stress, the crime and divorce rates, seem to be significantly lower in nearly all the counties than the state average. But these rural counties do appear to have current problems with adequate health care. It appears that all the counties besides Custer have serious deficiencies in meeting medical service standards of one physician for 1,000 people. There are no hospital facilities in Powder River or Treasure Counties.

TABLE 3-51
POPULATION TRENDS

Components of Change 1970 to 1981

County	Provisional[1]	1970[2]	Change[3]	Births[3]	Deaths[3]	Net Migration
Big Horn	11,400	10,057	13%	2,800	1,100	- 03%
Carter	1,700	1,956	- 13%	300	200	- 16%
Custer	13,400	12,174	10%	2,400	1,600	03%
Powder River	2,700	2,862	- 06%	500	200	- 26%
Rosebud	10,600	6,032	76%	2,300	800	52%
Treasure	1,000	1,069	- 06%	200	100	- 18%

Sources:
[1] Montana Department of Administration, Census and Economic Information Center, July 1, 1981
[2] U.S. Census of Population, 1970
[3] Bureau of Business and Economic Research, University of Montana.

TABLE 3-52
SOCIAL WELL-BEING CHARACTERISTICS BY COUNTY

	Big Horn	Carter	Custer	Powder River	Rosebud	Treasure	State of Montana
Percent population by age (1980)[1]							
17 years or less	36.6	28.0	29.4	31.0	37.2	29.6	29.6
18 to 64 years	55.3	57.1	57.3	59.2	57.0	57.2	59.7
65 years or more	8.1	15.2	13.2	10.0	5.9	13.1	10.7
Percent nonwhite population (1980)[1]	47.9	.4	2.2	1.8	25.5	2.3	5.9
Physicians per 1,000 population (1983)[2]	.3	.6	1.1	0.0	.6	0.0	1.3
Number of acute care hospital beds (1983)[2]	16	16	109	0	26	0	N/A
Divorce rate per 1,000 population (1978-82)[3]	5.2	2.5	7.4	3.0	4.7	3.1	6.2
Crime rate per 1,000 population (1975-81)[4]	18.0	2.0	36.0	7.0	25.0	13.0	43.7
Infant mortality rate per 1000 (1976-80)[5]	18.8	8.6	10.4	8.6	18.9	11.2	12.9
Percent attended college four or more years (1980)[6]	12.8	12.5	15.3	14.1	12.8	11.0	17.5
Percent urban (population above 2,500 + 1980)[6]	30.0	0.0	73.2	0.0	25.5	0.0	53.0
Percent rural (population below 2,500 1980)[6]	70.0	100.0	26.8	100.0	74.5	100.0	47.0
Percent farm	11.0	47.0	7.2	31.0	9.3	41.0	7.0
Unemployment rate (1982)[7]	9.2	3.6	6.2	3.1	6.3	5.3	8.6
Percent families below poverty level (1979)[6]	17.5	20.5	10.0	9.1	13.1	16.3	9.2
Median Income of Families (1979)[6]	15,729	12,821	18,445	17,665	19,792	14,107	18,418

SOURCE:

[1] U.S. Department of Commerce, Bureau of the Census, 1980, General Population Characteristics for Montana.

[2] Research, BLM staff.

[3] Bureau of Records and Statistics, Department of Health and Environmental Sciences, State of Montana, Sam Sperry, personal communication.

[4] Montana Department of Justice, Larry Peterson (personal communication).

[5] Montana Department of Health and Environmental Sciences, Montana Vital Statistics 1980 (is number of deaths under one year of age per 1,000 live births).

[6] U.S. Department of Commerce, Bureau of the Census 1980, Advance Estimates of Social, Economic and Housing Characteristics for Montana.

[7] Montana Research and Analysis, Department of Labor and Industry, Cathy Kramer (personal communication).

TABLE 3-53
SOCIAL WELL-BEING CHARACTERISTICS BY RACE

	Big Horn County		Rosebud County	
	White	American Indian	White	American Indian
Percent Population by Age (1980)				
14 yrs or less	22.9	37.6	27.6	42.6
15 to 64 yrs	65.2	58.3	65.7	54.1
65 yrs or more	11.9	4.1	6.7	3.2
% High School 4 yrs (1980)	37.9	31.4	46.3	32.0
% College 1 to 3 yrs (1980)	15.8	19.5	16.6	12.1
% College 4 or more yrs (1980)	17.4	5.6	15.0	3.0
Unemployment Rate for Persons 16 yrs & over (1980)	2.6	18.5	2.3	8.8
Median Income (Families 1979)	$17,052	$12,943	$23,019	$8,729
% Persons below Poverty level (1979)	11.7	31.8	9.6	44.9

SOURCE: U.S. Department of Commerce, Bureau of the Census 1980, Advance Estimates of Social, Economic and Housing Characteristics for Montana

Community Social Structure

Overall, the rural social communities in the Resource Area could be described as relatively informal and unstructured. Friendship networks are dense, which means a community resident knows just about everyone else in the community. The communities have developed a slow-paced and intensely personal lifestyle characterized by conservatism, frugality, a concern for and respect of others, a sense of independence, responsibility, and strong ties to the community. Because their communities are small and change slowly, most of the residents share the same norms of acceptable behavior. Because community life is so important to residents, care is taken to avoid conflict and to resolve it through informal means. Communities of this sort may change drastically when an influx of outsiders comes in with different values and norms of behavior (Fitzpatrick 1983).

More than 50% of the operators of ranches are 45 to 64 years old. This can be a factor in areas where coal is developed as the average age of construction workers and miners coming into an area will normally be younger (approximately 30 to 35). This could influence the decisions of community leaders in providing services to a growing community.

The most significant pattern of social change seems to be out-migration from Carter, Powder River and Treasure Counties, and in-migration to Rosebud and Custer Counties. Rosebud County, especially, has experienced social change due to in-migration of miners and construction workers. In Rosebud County, between 1970 and 1980, the number of households increased by 75 percent compared with a statewide increase of 30 percent. The communities of Colstrip and Forsyth were both impacted from this activity and the construction of related power plants. During the 1970's, a city-county planning board was established in response to the need for better land use and zoning control. Rosebud County applied successfully for impact monies from the Coal Board.

Unlike Rosebud County, in Powder River County the funding and planning mechanisms are not in place to handle a rapid influx of growth. Powder River County has only had to cope with minor short-term impacts from oil and gas development. There is no county planning office or zoning ordinance to help direct growth. The county seat of Powder River, Broadus, is a small, stable, old ranching community.

Northern Cheyenne

The Northern Cheyenne Indian reservation is located in Rosebud and Big Horn Counties. The 1980 census indicated 3,668 people were living on the reservation, 2,651 in Rosebud County and 1,017 in Big Horn County. The reservation economy is based mainly on jobs provided by the tribal government and federal programs (Northern Cheyenne Planning Office 1981), although the coal mining in Colstrip has provided more opportunities for Cheyenne employment and job training off the reservation. Training of Indians at Colstrip will provide a labor pool for new mines as they are developed.

The Northern Cheyenne are trying to maintain their culture as a Native American society through their language, religion and social values. The Northern Cheyenne culture has traditionally been passed on to succeeding generations through the extended family and kinship systems (Northern Cheyenne Planning Office 1981). The cultural value placed on kinship, spirituality and the natural environment is very strong. The Cheyennes are concerned about cross-cultural contact and that it may be causing the gradual disintegration of their culture.

Crow

The Crow Indian Reservation is located in Big Horn and Yellowstone Counties in Montana. Of the total 1,541,343 acres of Indian and BIA land, 89 percent is located in Big Horn County and accounts for about 43 percent of the county's land base. In 1980 there were approximately 4,792 Crow and 1,966 non-Crow living on the Crow reservation (Mountain West Research-North 1982). The reservation economy is based mainly on jobs provided by the tribal government and federal programs. The Absaloka mine north of the reservation also provides employment opportunities to the Crow. Westmoreland Resources and the Crow have negotiated a hiring preference for the tribe. The coal is owned by the tribe.

Factionalism in tribal government, and the presence of significant numbers of non-Indians complicates the social organization within the reservation. The Crow have lost a good deal of control over lands within the reservation. There is general agreement that the Crow culture and lifestyle is remaining strong and vital. This is attributed to the intrinsic adaptability of the Crow culture. Within the tribe, there is a lack of concern that the Crow way of life and culture are threatened by greater participation in non-Indian activities (AITS Study 1983).

Tribal Policies on Coal Development

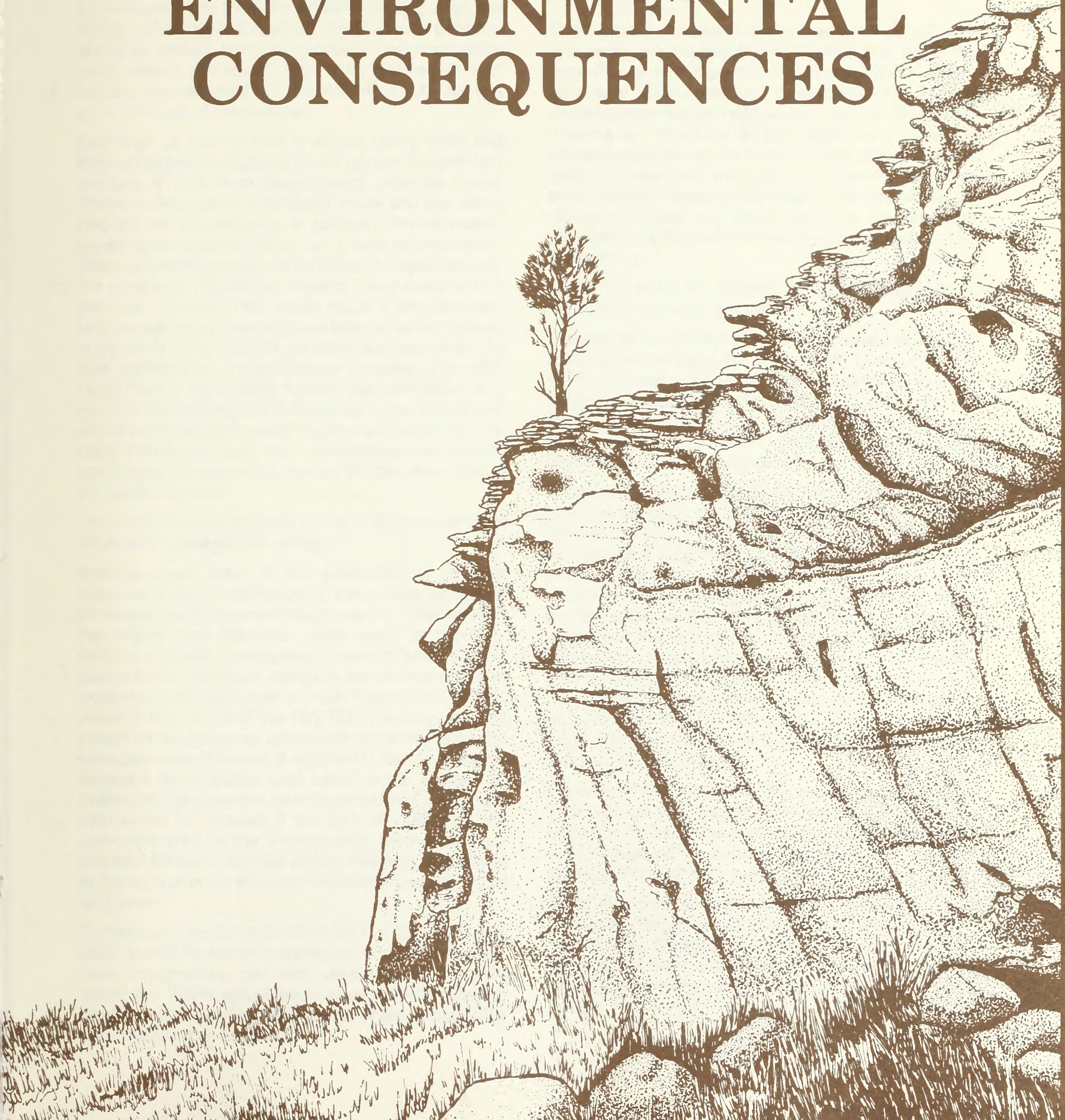
The Northern Cheyenne tribe and the Crow tribe have different policies concerning coal development on the reservation. The Cheyenne presently (1983) do not want coal development on the reservation. They are concerned about impacts and are, at the same time, interested in employment opportunities. The Crow have made an agreement with the Shell Oil Company to develop the Young Creek Coal Mine on the reservation.

Social Attitudes and Values

The Montana Department of State Lands conducted a telephone survey of social attitudes of 85 Ashland-Birney-Otter Creek area residents in 1981. Most of the respondents were employed in agriculture. Over 75% of the respondents would be reluctant to move away from the area for any reason. They like their communities because they value privacy, countryside, way of life and their friends. They perceived their medical facilities to be their most inadequate community service.

Although there have been serious down-turns in the agricultural sector of the economy, many eastern Montana ranchers/farmers persist in their way of life. There is evidence to suggest that they value their self-sufficient, independent, rural lifestyle more than sheer economic rationality would allow. What many appreciate is the opportunity to be their own boss, the ability to work out-of-doors, and the challenging nature of the work (BLM 1981).

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES



Coal

A maximum of 65.18 billion tons of coal with development potential, plus any additional coal mined as a result of emergency leases, would be irretrievably and irreversibly lost by mining. It is anticipated that the demand for coal in the future will be much less than the total available. Most areas cleared in planning would not be delineated into tracts for possible leasing. Also, it is highly unlikely that all coal with development potential would be mined, because currently, coal companies rarely extract coal under more than 200 feet of overburden, whereas coal with development potential has up to 500 feet of overburden.

Exchange of coal for coal in alluvial valley floors and through legislative dictums could remove a significant amount of coal from development potential status. These exchanges are mandated by law and regulation and are not discretionary. In addition, this alternative would allow coal exchange on a case-by-case basis. Although exchanges would be limited to equal value, in the short term, significant impacts could occur to federal coal royalties. This would result if checkerboard federal coal areas were acquired and mined by a private entity controlling adjacent sections, at a time when the coal market is too limited to absorb leasing of an additional tract of completely federal coal delineated as a result of the exchange. In the long term, the federal coal would be mined and royalty impacts would be insignificant. Exchanges may also compensate the federal government by providing resources other than coal to the public domain.

There would be no impacts on the coal resource from vegetation management actions.

Impacts could occur to the availability of the coal resource if sale or exchange of the surface permitted the new surface owner to deny consent to mine underlying federal coal. However, since areas of currently defined coal with development potential have all been placed in the "retention" category, the acreage involved would be small and impacts would be insignificant. It is possible that some of the 164,723 surface acres proposed for exchange or sale could occur in areas with unknown coal potential. A significant loss of potential revenues from federal coal could occur if areas of unknown coal potential were disposed of. Coal ownership would be retained if the lack of coal were not demonstrated in the site-specific mineral report required for each disposal action. However, a disposal of the surface could affect surface owner consent in the long term.

Because neither Zook Creek WSA nor Buffalo Creek WSA would be recommended as suitable for wilderness designation, coal with development potential within the WSAs would become available for further consideration pending application of the unsuitability and multiple use screens.

Summary

There would be significant irreversible and irretrievable impacts from coal mining, no impacts from proposed vegetation management and wilderness actions, and no known significant impacts from lands actions.

Other Minerals

Three oil and gas fields, Liscom Creek, Pumpkin Creek, and Leary, extend into the acceptable coal area. The area of long-term impact covers about 2,400 acres. An additional 5,600 acres were deleted from coal leasing consideration due to multiple use conflicts. Short-term impacts are expected to be insignificant since the affected areas lie outside current areas of coal industry interest. Long term impacts are unknown. The only other mineral resources of note in the coal areas are clinker and sand and gravel. Because they are very abundant, conflicts with coal actions are expected to be insignificant.

There would be no impacts on other minerals from vegetation management actions.

Disposal of the surface estate over reserved oil and gas minerals would have the impacts of: 1) reducing the BLM workload of checking reclamation from seismic exploration and 2) complicating the permitting process for the lessee, since an additional participant (the surface owner), besides BLM, would be involved, these impacts would not be significant.

There would be no impacts on claimed locatable minerals, since lands with mining claims recorded under Section 314 of FLPMA are prevented from being exchanged or sold. Disposal of the surface estate would prevent unclaimed locatable minerals from being claimed and recorded, pending regulations issued by the Secretary of the Interior. The resulting long and short-term impacts would not affect BLM, since the federal government receives no royalties from locatable minerals, but impacts would occur to private mining parties who lose access to potential mineral resources. Some of the 164,723 surface acres proposed for exchange or sale would be significantly affected, especially in the Alzada area.

Disposal of the surface estate would not affect BLM ownership of underlying mineral materials. A 1983 U.S. Supreme Court decision affirmed public ownership of sand and gravel on lands where the surface only was patented. Mineral entry rights would be preserved.

There would be no impacts on the availability of Zook Creek and Buffalo Creek WSAs for oil, gas, or geothermal leasing, location of mining claims, or material sales, since both areas would be recommended as nonsuitable for wilderness designation.

Summary

There would be insignificant impacts from coal mining, no impacts from proposed vegetation management and wilderness actions, and significant impacts from lands actions in localized areas.

Range

If all the areas were mined, there would be an approximate loss of 198,700 AUMs during mining on public and private surface. The most serious effect on vegetation after reclamation would be the irretrievable and irreversible loss of the natural vegetative mosaic and species diversity on all 993,591 acres. However, long term vegetation production may be better after mining due to extensive reclamation work. Fifteen thousand acres identified as needing range improvements overlap with areas acceptable for further coal leasing consideration. When public surface is delineated within a tract for possible coal leasing, as well as within existing coal leases, no additional range improvements would be proposed.

Current vegetation utilization for livestock of 208,083 AUMs would continue in the short term (5 years) and increase by 12% to 233,387 AUMs in the long term (15 years) through range improvements on the 60,024 acres of selected fair and poor condition rangeland. Range condition would be expected to improve by 15%. This increase in AUMs is based on soil productivity potential.

The overall effect of the proper application of mechanical treatments on 125,023 acres over the long term would be an improvement of range condition and a 100% increase in vegetation production.

Development of structural range improvements would reduce available forage by 1,819 AUMs during construction, but would increase the overall range condition on those acres that are selected for range improvements.

The 72 potential activity plans on 215,905 acres, when implemented, would have an increase in plant vigor and species diversity. There would be a 15% increase in range condition and a 12% increase in AUMs.

The 12 functional AMPs would have no new impacts on vegetation production.

As the 15 nonfunctional AMPs become more functional, there would be a 15% increase in plant vigor, species diversity and an overall increase in AUMs due to possible changing of grazing systems. However, because of the relatively small number of acres, totaling 24,426, there would be an insignificant increase in range condition.

The wildlife projects that would be constructed would have no impact on vegetation production.

Improved management, range improvement placement and use supervision would result in improvement of 5,000 acres of riparian areas to a healthy woody riparian condition, having all age classes of trees represented with 30% or more of the stand being sapling or younger. Reduced use of riparian zones as forage areas and shade sources for livestock would result in an increase in cover and plant community structure and health.

Control of 40 acres of prairie dog towns would have an immediate effect of improving vegetative production and range condition on the 40 acres. Production would increase 100%, because of improved plant vigor and the transition of the plant community from low to high producing species. Increased vegetation, shade and litter would increase site moisture retention and improve plant growth conditions.

Control of 130 acres of noxious weeds would result in up to a 200% increase in range condition on those affected acres through increases in desirable plant species, useful vegetation production and improved soil protection.

The short-term effect of prescribed burning on 20 acres and 500 acres burned from wildfires would be a loss of all forage being produced on the site. The long-term effect depending upon the range site, would be a 50 to 70% increase in livestock forage through recovery of more desirable plant species.

Vegetation Utilization—Livestock

Current short-term utilizations would not affect livestock. Long-term increased utilization of 25,304 AUMs would provide feed for an additional 4,217 adult cattle for a six-month grazing season.

Livestock stress, due to moving livestock between pastures, would increase slightly on potential activity plans if implemented. Reliable spring livestock forage and cover for young calves would be provided in grazing systems. Livestock breeding success would be improved by fencing, which would create closer stock confinement. Changes in grazing management practices on allotments without activity plans would be minor and have little impact on stock.

As M & C allotments would generally not be improved, maintaining current use would not affect livestock.

Livestock production would increase and grazing distribution would improve because of land treatments and range improvements.

There would be a short-term loss of 2,358 AUMs and a long-term loss of 8,237 AUMs from land sales. The sale of these tracts would result in more efficient grazing administration.

There would be a short-term loss of 7,074 AUMs and a long-term loss of 24,709 AUMs from land exchanges.

The loss of AUMs could be offset by similar or greater amounts of vegetation production in lands gained from exchanges. Exchanges which consolidate tracts of public lands would result in more efficient grazing administration.

Lands disposal through R&PP actions would have no significant impact on the range resource.

Because Zook Creek WSA is recommended as nonsuitable for wilderness designation, there would be no impact on the range.

Because Buffalo Creek WSA is recommended as nonsuitable for wilderness designation, there would be no impacts on the range resource in the short term. In the long term, 689 acres would be upgraded to good condition by range improvements. There would be an increase of 144 AUMs for livestock and 432 AUMs for wildlife and other nonconsumptive uses.

Summary

There would be significant cumulative impacts on vegetation from coal mining, proposed vegetation utilization, and land sales actions. Impacts on vegetation from land exchanges and wilderness actions would be insignificant. Under this alternative 85% of the rangeland would be in good or better condition after improvement.

Hydrology

Coal—Surface Water

Impacts to surface water quantity from coal mining are expected to be insignificant during mining and reclamation. Streamflow downstream of the mine sites would be retarded and possibly reduced by sedimentation ponds on the mine site. The overall effects would be to reduce flood peaks and slightly reduce streamflows. Surface runoff and associated peakflows would probably increase by approximately five percent, due to the decreased infiltration capacity of spoils immediately following reclamation (Arnold and Dollhopf 1977). Dollhopf (1979) predicts that the infiltration would improve as root systems develop and become similar to native rangeland. It is estimated to take 10 to 15 years to regain prior infiltration capacity. The net long-term effect of mining on surface water quantity would be insignificant.

Impacts to surface water quality are also generally expected to be insignificant during mining and reclamation. State regulations limit amounts of suspended solids, iron, manganese, and acidity in waters discharged from mined land. Monitoring is required to assure compliance. Impacts could be significant in isolated areas where groundwater from a mining area is the major contributor to the surface water drainage. In such areas water would probably remain suitable for stock use, but not for agriculture. During mining, increased sediment loading from disturbed areas would be trapped by sedimentation ponds. After mining, sediment and water yields would be reduced by 574 ac ft/yr and 27,462 ac ft/yr respectively, assuming reclamation and revegetation are successful (Table 4-1).

After reclamation, groundwater discharging from mined areas and carrying an increased salt load from leaching would add significantly to the salinity of nearby springs, seeps, and intermittent streams. The degree of increase depends on the geology of the area, but general increases of 500 to 2000 mg/l TDS can be expected (MDSL and OSM 1983). Rahn (1976) found these increases typically were sulfates, calcium, magnesium and bicarbonates. Van Voast et al (1978) speculates that most materials available for dissolution in the reclaimed spoils would be flushed with the first pore volume of water. However, in dry climates, such as found in eastern Montana, this process may take hundreds to thousands of years. In a practical sense, the impacts would be cumulative from all mined areas where salts were not flushed. Van Voast and Thompson (1982) have shown that no single mine can cause significant impacts to the Tongue River's quality or rate of flow. It is the cumulative effects from several mines which have the greatest chance of impacting a region's water resource. Estimates made by Van Voast for cumulative effects caused by nine active or proposed mines in the vicinity of Decker, Montana, show that post-mine groundwater reaching the Tongue River would increase its median dissolved solids content from 480 mg/l to 510 mg/l.

A USGS modeling study (Woods 1981) predicts that Tongue River salinity would increase four to five percent following strip mining of 120,000 acres of federal land in southeastern Montana. This is less than one-tenth the increase caused by withdrawal and return flow of irrigation water. These results indicate that long-term regional effects from cumulative mines would not be significant in the Tongue River, but could be significant in smaller streams where groundwater from mined areas contributes a larger percentage of total surface water flow.

Coal—Groundwater

During mining, impacts to the local groundwater would be significant. Aquifers in the overburden and coal would be disrupted. Springs, seeps, and shallow wells in the immediate mine area would dry up or experience lowered water levels. Drawdown in wells caused by mining has been observed to extend from less than one-half mile to three miles (Hardaway and Kimball 1979; Van Voast et al 1978; Dollhopf et al 1978). The influence would vary with the direction of groundwater flow and would be typically greater in the down gradient direction (Van Voast et al 1977). After reclamation, impacts would be mitigated as the coal seam and overburden aquifers are replaced by a spoil aquifer. Depth and flow of groundwater in spoils would not differ greatly from conditions in undisturbed coal aquifers, but it may take several years for water levels to recover (Van Voast et al 1978).

According to Hardaway and Kimball (1978), a variety of professionals indicate that impacts are not significant on groundwater quality during mining. A mine acts as a sink for groundwater and precludes any possible flow of contaminants into the groundwater system. Water intercepted during mining is pumped into holding ponds and discharged only in accordance with state regulations. Seepage from holding ponds has impacted downstream areas in isolated cases. Impacts can be mitigated by diligent pond construction methods.

In reclamation, overburden is used to refill the pits, thus exposing new surfaces to invading groundwater. These fresh surfaces contain significant quantities of leachable salts and minerals that readily dissolve. Thus, groundwater in mined areas shows increases in dissolved solids. The spread of pollutants from reclaimed areas is difficult to predict. Van Voast (1980) and Ahern and Frazier (1981) state the areal extent is modified by sorption, chemical precipitation, and dilution and may be limited to a few hundred yards from pit boundaries. Other studies (Rahn 1976 and Moran et al 1976) suggest this spread may extend several miles downgradient from pit boundaries.

Coal—Hydrology Summary

Present and anticipated levels of coal mining indicate that regional losses to surface and groundwater resources from coal mining would be insignificant. However, in localized areas, there would be significant impacts to groundwater quantity during mining and reclamation. These impacts would not be irreversible or irretrievable. Significant impacts to groundwater quality

TABLE 4-1
SUMMARY OF WATERSHED IMPACTS

PREFERRED ALTERNATIVE

Impacting Element	Sediment Yield (ac ft/yr) Initial	Sediment Yield (ac ft/yr) Long Term	Water Yield (ac ft/yr) Initial	Water Yield (ac ft/yr) Long Term	Surface Water Quality Long Term	Groundwater Quality Long Term
Grazing Treatments	96	95	3,308	3,281	+	0
Mechanical Land Treatments	344	I	11,830	I	+	0
Fences	6	12	195	347	—	0
Water Developments (wells, springs, res.)	I	I	I	I	0	0
Fire	1	I	43	I	0	0
Chemical Treatments						
Noxious weeds	10	5	311	183	+	0
Prairie dogs	3	2	96	56	+	0
Riparian Areas	14	1	468	137	+	0
Coal Mining	1,717	1,143	86,723	59,261	—	—
Zook Creek WSA	10	7	494	338	—	—
Buffalo Creek WSA	8	5	388	265	—	—
TOTAL	2,209	1,270	103,856	63,868	—	—

I — insignificant
+ — increase
0 — no change
— — decrease

SOURCE: Omang, Parrett, and Hull 1983, BLM 1983 and Appendix I in localized areas would occur and would be irretrievable and irreversible. In the worst case situation, regional groundwater quality degradation would occur and persist for hundreds to thousands of years.

Vegetation Utilization—Hydrology

Construction of range improvements such as fences would result in increased sediment and water yields of six ac ft/yr and 152 ac ft/yr, respectively. The increase would be caused largely by livestock trailing along new fences.

Development of reservoirs and pits would temporarily disturb soil. Nearly all soil disturbance would be upstream of dams and would not contribute sediment below the dam. Development of springs and wells would disturb an insignificant amount of soil and would not impact sediment or water yields.

Mechanically treated areas would be exposed initially to wind and water erosion. However, infiltration would be improved, leading to increased soil moisture and vegetative cover (Wight and Sidoway 1972; Ryerson et al 1980; Saulman 1973; Neff and Wight 1977; Neff 1980). Sediment and water yields would be reduced by 344 ac ft/yr and 11,830 ac ft/yr, respectively. Mechanical treatment would not occur if holders of downstream water rights would be adversely affected.

Continued development and revisions of allotment management plans would slowly improve watershed condition. Sediment and water yields would consequently be reduced slightly in the long term by one ac ft/yr and 27 ac ft/yr, respectively.

Special management considerations for approximately 5,000 acres of riparian areas would result in less streambank erosion and improved water quality (Holechek 1980). Sediment and water yields would be reduced slightly in the long term by 13 ac ft/yr and 331 ac ft/yr, respectively.

Control of 40 acres of prairie dog towns and rehabilitation of the town sites would have an insignificant impact to water resources in the short term. In the long term, the cumulative impact would be to reduce sediment and water yields by one ac ft/yr and 40 ac ft/yr respectively, a very slight reduction.

High concentrations of noxious weeds force livestock to graze noninfested areas. Consequent reductions in vegetative cover would increase sediment and water yields (Noble et al 1979). Treatment of 130 acres of noxious weeds would result in reductions of sediment and water yields of five ac ft/yr and 128 ac ft/yr feet respectively.

Acres burned by either prescribed burns or wildfires would expose bare ground to water erosion. Sediment and water yields would increase very slightly in the short-term by one ac ft/yr and 43 ac ft/yr, respectively. Natural revegetation of burned areas in the long-term would return sediment and water yields to pre-burn conditions.

Lands—Hydrology

No significant impacts to water resources would result from lands sales or exchanges.

Wilderness—Hydrology

Zook Creek and Buffalo Creek WSAs would be recommended as nonsuitable for wilderness designation and would be available to coal mining. If mined, sediment yields would decrease by six ac ft/yr and water yields would decrease by 279 ac ft/yr, assuming reclamation and revegetation techniques were successful. There would be no irretrievable or irreversible losses to surface water quantity and quality in either the short or long term. There would be significant impacts to groundwater quantity in the short term, but these impacts would not be irretrievable or irreversible. There would be significant impacts to groundwater quality in both the short and long term. These impacts would be irretrievable and irreversible.

Summary

Cumulative sediment and water yields would be reduced by 939 ac ft/yr and 39,988 ac ft/yr respectively, a moderately significant reduction. Significant losses in groundwater quantity and quality would occur in localized areas near mine sites. Groundwater quality degradation could occur on a regional basis and persist for hundreds to thousands of years. Mechanical treatments would significantly reduce sediment and water yields. Other vegetative, lands, and wilderness actions would have no significant impacts on water resources.

Soils

Impacts to the soil during coal mining would involve significant increases in erosion and runoff on all 993,591 acres. Losses from wind and water erosion would be 43,457 acre feet of soil over the entire area disturbed. Successful reclamation potential is questionable on 120,000 acres that are in land capability Classes VII and VIII because of topography, depth to bedrock, rock outcrops and steepness of slope. Direct impacts to the soil from mining disturbances would alter the soil structure and porosity. This alteration would affect permeability, infiltration rates, soil-air and soil-water relationships and bulk density. The natural fertility would be reduced by disruption of the nutrient cycle and a decrease in the organic matter content.

Proper replacement of subsoil and topsoil is critical for successful reclamation. Salt migration to the surface after profile reconstruction is possible, increasing the sodium content of the topsoil from its original level. This could decrease plant production and lower reclamation success. If layers of toxic soil material and restrictive layers are replaced lower in the profile than where they were originally found, plant production may be better after reclamation.

With proper mitigation, there would be no impacts to the soil resource after reclamation.

This alternative would improve 160,024 acres of watershed to good condition in the long term through better distribution of livestock and water sources, and implementation of land treatments.

Management of livestock would redistribute grazing away from critical areas such as floodplains, riparian areas and around reservoirs, where possible. These areas are subject to trampling and compaction, which reduce vegetation and increase runoff and erosion.

In addition, construction of 410 range improvements would distribute the livestock to utilize upland areas and allow watershed conditions to stabilize.

Aproximately 125,023 acres in the "I" category have the potential to be mechanically treated, which would cause a loss of 175 acre-feet of soil from wind erosion.

Wind erosion would cause 22 acre feet of soil loss from the construction of 320 reservoirs, pits and pipelines and one acre foot of soil loss from livestock trampling along 100 miles of new fence lines.

Prairie dog control on 40 acres would increase vegetative cover 100% in the long term and reduce runoff and erosion.

Noxious weed control on 130 acres would initially kill vegetation, leaving dead plant residue that would help control wind and water erosion. In the long term, the treated areas would have a 200% increase in range condition through an increase of desirable plant species, minimizing erosion hazards.

Prescribed burning on 20 acres and 500 acres burned from wildfires would remove most vegetation, leaving only plant residue in the short term. This would increase the available plant nutrients in the soil, but also would cause accelerated erosion and the loss of organic matter. In the long term, there would be a 50 to 70% increase of vegetation over the current production level, which would minimize erosion hazards and offset the short term soil losses. See Table 4-1 for sediment yields from water erosion by range improvements.

In the short term, there would be a loss of 198 acre feet of soil through wind erosion from project construction. In the long term there would be no significant loss of soil.

The sale of 41,181 acres would not impact the soils resource except where there may be a change in land use. The type of change made, i.e., agriculture and road or building construction, would determine the amount of erosion. This is expected to be an insignificant loss. The exchange of 123,542 acres would not impact the soils resource if there is not a change of use, since an equal value of lands would be received.

The disposal of lands through an R&PP action would be an insignificant impact on the soils resource if a land use change were to occur.

There would be no significant impacts to the soils resource in Zook Creek WSA.

Short-term impacts to the soil from coal mining in Zook Creek would involve significant increases in erosion and runoff on 4,000 acres. Losses from wind and water erosion would be 175 acre feet of soil over the entire area disturbed. Reclamation potential is questionable on 2,640 acres that are in land capabilty Class VII, because of topography, depth to bedrock, rock outcrops and steepness of slope. Direct impacts to the soil from mining disturbances would be the same as described in the section on soil impacts from coal mining. With proper mitigation, there would be no impacts to the soils resource after reclamation.

There would be no significant impacts to the soils resource in the Buffalo Creek WSA.

Short term impacts to the soil from coal mining in Buffalo Creek WSA would involve significant increases in erosion and runoff on 5,650 acres. Losses from wind and water erosion would be 247 acre feet of soil over the entire area disturbed. Reclamation potential is questionable on 229 acres that are in land capability Classes VII and VIII, because of topography, depth to bedrock, rock outcrops and steepness of slope. Direct impacts to the soil from mining disturbances would be the same as described in the first two paragraphs of this section. With proper mitigation, there would be no impacts to the soils resource after reclamation.

The potential to implement mechanical treatments on 587 acres in Buffalo Creek would cause losses of 25 acre feet of soil to wind erosion. This is a short-term loss of soil and would be insignificant in the long term.

Summary

The cumulative loss of soil from coal mining and vegetation management actions would be 44,076 acre feet (43,879 and 197 acre feet, respectively). The losses from these actions would be insignificant with proper mitigation. Impacts from land and wilderness actions would be insignificant.

Wildlife

Coal development on all 993,591 acres would result in significant local impacts to wildlife, even if mitigation for the loss of wildlife habitat were successful. Wildlife habitat mitigation required under state and federal regulations would limit most impacts to the mining and reclamation phase. As mining occurs, wildlife habitat would be destroyed; that would be a significant impact. Each of the 22 current federal coal leases identifies wildlife concerns where they occur within each lease.

BLM coal planning prior to 1982 identified 1,619 acres of sharp-tailed grouse, sage grouse and antelope habitat for which mitigation would be required. The 1982 MFP Amendment identified 3,004 additional acres of critical wildlife habitat for which mitigation would be required. This includes sharp-tailed and sage grouse leks and sage grouse and antelope wintering areas.

In addition to these impacts, the following habitats would be impacted:

(1) In the vicinity of Decker and in the uplands west of the Tongue River Reservoir, 16,000 acres of mule deer and antelope winter ranges, sharp-tailed and sage grouse leks, sage grouse wintering areas, prime turkey, antelope and mule deer habitats;

(2) In the Tongue River uplands from the Rosebud-Carter County line to the Wyoming border, 29,800 acres of prime turkey and mule deer habitats;

(3) In the headwaters of the Hanging Woman and Otter Creek drainages, 28,000 acres of sharp-tailed and sage grouse leks, prime antelope and mule deer habitats;

(4) In the Powder River uplands from Broadus to Moorhead, 280,000 acres of prime mule deer habitat;

(5) In Rosebud and Big Horn counties, north of the Northern Cheyenne Indian Reservation, 2,800 acres of sharp-tailed grouse leks, prime antelope and mule deer habitats;

(6) In the Pine Hills, east of Miles City, 320 acres of sharp-tailed grouse leks and bighorn sheep habitat;

(7) In the Pumpkin, Mizpah, and Foster Creek drainages 14,000 acres of sharp-tailed and sage grouse leks, prime antelope and mule deer habitats.

These figures are best estimates, because of the large acreage pending further study. Critical wildlife habitat will be given consideration in the application of the unsuitability criteria to these areas.

Total restoration of some habitat types, such as 191,000 acres of steep breaks and woody draws, has not been fully demonstrated. Areas that are reclaimed would have the potential to produce high quality spring and summer habitat.

During mining, development and increased harassment would cause movement of wildlife species to less disturbed habitat. Increased human activity would result in increased poaching. These impacts would be significant during the mining and reclamation phase. Species distribution would return to a more natural state with the completion of reclamation. Because it has not been demonstrated that all types of wildlife habitat can be successfully reclaimed and because of the large amount of acreage involved, impact to wildlife would be significant even after reclamation activities.

Although no major fisheries would be directly impacted, the watersheds in the potential mining areas do influence water quality of Yellowstone River tributaries. Each of these is important to the local sport fishery, and impacts caused by mining could be significant. Mitigation during and after mining should target potential siltation and water quality and flow problems.

All known threatened and endangered species use areas were eliminated from further lease consideration in the application of unsuitability criteria, where inventory was complete. After application of the unsuitability criteria to the areas pending further study, all known threatened and endangered species use areas will have been eliminated from further consideration. Increased development and human activity would result in increased disturbance of transient threatened and endangered species, including bald eagles and peregrine falcons, which may migrate through developed areas.

Any emergency leases or coal exchanges which may develop under this alternative must be considered on a case-by-case basis, to assure the protection of critical wildlife habitat.

Proposed vegetation utilizations of 624,249 AUMs in the short-term and 700,161 AUMs in the long term for wildlife and nonconsumptive uses would have favorable impacts on wildlife. There would be no significant impacts on wildlife during the short-term. Mitigation measures and project stipulations on range developments would result in an overall benefit to wildlife. In the long term, range condition would improve and, in most cases, would result in improved wildlife habitat.

Mechanical treatments of up to 125,023 acres would have significant short-and long-term impacts on wildlife habitat, because of the large amount of land involved.

Vegetation manipulation would alter the wildlife population density and diversity in the treated areas. All wildlife would be displaced temporarily. The expected 15% increase in succulent spring grass and forbs would benefit some species seasonally. However, decreased vegetative diversity would reduce the abundance and diversity of wildlife species. Big sagebrush habitat, critical to antelope and sage grouse survival, would be evaluated on a case-by-case basis to protect that resource.

Since wildlife concerns would be addressed in each of the 72 potential activity plans, impacts from habitat disturbance or destruction would be minimal. Range improvements totaling 410 projects would displace wildlife temporarily on 572 acres, due to habitat disruption and increased human activity. Developed water sources would be beneficial to wildlife. They would help break up heavy concentrations of livestock at overused watering sites and would provide additional water sources for all forms of wildlife.

Care would be used in selecting water development sites to avoid damage to important wildife use areas such as woody draws.

Construction of 100 miles of fence would result in better distribution of livestock. Fences would be constructed so as to minimize movement barriers to big game by utilizing standards outlined in BLM Manual 1737. If fences are built in big game wintering and concentration areas, there would be significant short- and long-term impacts.

Increased wildlife/livestock competition in areas to which livestock are redistributed would be offset by increased residual vegetation available in the areas from which the livestock are moved.

Grazing systems which provide spring rest or deferment would improve the quality and quantity of forage, especially forbs, and would make them more available to deer, antelope, bighorn sheep and grouse. The quality and quantity of nongame forage and cover would increase as a result of grazing treatments.

Upland game birds require the residual vegetation for nesting and winter survival usually found in areas of light or no grazing. Through the use of grazing systems or treatments to provide greater distribution of cattle, residual cover in the current low or no use areas would be decreased. However, this would allow for greater vegetation production in the current high use and concentration areas to offset the loss.

Additional residual vegetation and greater vegetative production due to the use of grazing and land treatments would help upland nesting waterfowl. Residual vegetation for nesting and brood rearing would be available near reservoirs and in rested or deferred pastures.

Fencing approximately 21 of the new water developments would benefit nesting birds by providing four to eight acres of residual vegetation for cover at each site.

The average annual installation of 20 bird ramps in stock tanks would be beneficial to all small wildlife species that use these water sources. The ramps help prevent the drowning of small animals. The continued construction and placement of an average of 20 bird nest boxes and 10 goose nesting platforms annually would benefit mainly waterfowl, kestrels and bluebirds.

The average annual construction of one livestock exclosure around a new pond development would benefit waterfowl by providing undisturbed nesting cover. The continued stocking or restocking of gamefish in two stockponds annually would benefit the general public by maintaining good fisheries. Reservoirs identified as suitable for recreational fishing would be fenced to provide and maintain a quality fishery. A tank, water gap or other means of livestock access to water would be provided.

Maintaining woody riparian reproduction in areas to provide 30% of the woody species as saplings or younger trees would assure continued age class diversity in the system. This would assure the availability of browse for use by wildlife through winter months.

Control of 40 acres of prairie dogs would further reduce the known prairie dog acreage by 1.5%. There is concern that as this natural habitat is further reduced, the prairie dog and associated species would reach dangerously low population levels, locally as well as regionally.

The treatment of 130 acres of noxious weeds, particularly Canada thistle, would reduce the available food for seed-eating birds. The small acreage treated would have minor impacts on wildlife.

Implementing prescribed burn plans on 20 acres annually and modified fire suppression plans would eliminate some dense vegetation. Although some wildlife species do require dense trees or shrubs, extensive areas of dense vegetation could be of greater value to wildlife if it were thinned with scattered openings.

There would be no significant impacts on threatened or endangered species. Each range improvement project would be surveyed for the occurrence of threatened or endangered species; recommendations would be made for appropriate mitigation or project stipulations. Any control of prairie dogs would decrease the potential habitat for black-footed ferrets.

Disposal of 165,054 acres would mean the loss of BLM control on that wildlife habitat. The lands program also offers potential for the exchange of lands having equal or greater wildlife habitat values which would benefit from public ownership. With over 15% of the public lands considered for disposal, there would be moderate negative impacts on wildlife habitat, depending on the vehicle for disposal. These losses would be less, with a higher percentage of exchanges rather than sales. In exchanges, little significant wildlife habitat would likely be lost, and some may even be gained. In land sales, consideration would be given to major wildlife concerns, but BLM would lose control of any wildlife habitat which would be sold. Since major wildlife concerns would be addressed on a case-by-case basis early in the discussions of any land exchange or sale, significant impacts would be considered in the decision process.

Those impacts would be reduced or mitigated as much as possible. Threatened and endangered species habitat would be given special consideration before any land transactions, to avoid adverse impact to threatened or endangered species. Overall the impacts from lands actions would be insignificant.

Recommending Zook Creek WSA as nonsuitable for wilderness designation would allow the possible development of ORV use, range improvements, and post and pole cutting. In the short-term there would be significant impacts on sharp-tailed grouse leks, turkey winter habitat and critical mule deer range because of local disturbance. Because of the limited acreage involved, the long-term impacts would be insignificant even with the addition of impacts from oil and gas development.

Opening 4,000 acres to coal development would have significant impacts on wildlife due to habitat destruction and disturbance during mining. Long term impacts of coal development would also be significant since reclamation of draws and steep breaks has not been demonstrated. Application of the coal unsuitability criteria would protect threatened and endangered species as well as species of special concern to state and federal agencies.

Recommending Buffalo Creek WSA as nonsuitable for wilderness designation would allow possible development of the oil and gas resources, ORV use, range improvements, and post and pole cutting. There would be localized, insignificant adverse impacts to nesting raptors.

Opening 5,650 acres to coal development would have significant impacts on nesting raptors due to habitat destruction and disturbance during mining. The long-term impact in this area would be insignificant if mitigation measures were successful. Application of the coal unsuitability criteria would protect threatened and endangered species as well as species of special concern to state and federal agencies.

The identified environmental consequences on these two specific areas are based on extensive but incomplete inventory data; these site specific consequences cannot be extrapolated to the entire resource area where the habitat diversity is vastly greater.

Summary

There would be significant impacts on wildlife due to destruction and disturbance of wildlife habitat from coal mining actions, because of the large amount of acreage involved. The cumulative impacts from proposed vegetation management actions would be beneficial to wildlife, except for the negative impacts due to extensive mechanical land treatments. There would be no significant cumulative impacts from land and wilderness actions, except where coal would be developed in areas designated nonwilderness.

Cultural Resources

Based on projections from inventoried lands, from 3,300 to 9,900 cultural resource sites would be affected if all coal areas considered are mined. Previous evaluations of cultural resources indicate that between 5% and 20% of these sites may be significant and eligible to the National Register of Historic Places.

Impacts of coal mining would be minimal once prescribed mitigation in laws, regulations, and policies pertaining to cultural resource management were followed.

Improved range condition would generally benefit cultural resource sites by increasing ground cover and reducing erosion. However, some developments such as mechanical treatments and burning would destroy the context or structure of a site. Mitigation through existing policies, however would minimize the impacts of ground-disturbing treatments on cultural resource values.

Lands identified for potential sale, exchange or other disposal action would be inventoried for prehistoric and historic sites. Through existing policies for mitigation, the effects on cultural resource values would be minimal. Through exchange, lands could be gained with greater cultural resource values.

There has been no intensive inventory of the cultural resource at either Zook Creek or Buffalo Creek to suggest direct impacts. Sites which could exist in the areas would be subject to the impacts of continued multiple use management. Applying existing mitigation policies would minimize the effects on cultural resources.

Summary

The impacts of all actions on cultural resources would be minimal.

Paleontologic Resources

Impacts on the paleontologic resource by coal mining would be minimal. Plant and mollusk fossils are widespread and common throughout the mineable portions of the Fort Union and Wasatch formations. However, two significant vertebrate fossil localities are recorded in the area of coal with development potential. More undiscovered localities may exist.

Paleontologic resources would be little affected from vegetation utilization proposals. Some trampling of significant localities by livestock would occur. Avoidance or collection of paleontologic material when constructing range projects would occur on a case-by-case basis. Special emphasis would be placed on projects located in the Hell Creek formation to avoid damage to significant localities.

Approximately 19,000 acres or 12% of the 165,054 acres identified for disposal and 570 acres or 21% of the 2,760 acres identified for further study fall within the exposures of the Hell Creek formation. A potential loss within the Hell Creek formation would occur on 4,892 acres due to sales and 14,678 acres due to exchanges. There would be an overall loss to the public of paleontologic resources on 4,892 acres (5% of Hell Creek formation exposed on public land). In a "worst case" situation with no mitigation measures applied to the exchanges, there would be a total loss of public management of paleontologic resources on 19,570 acres (21% of Hell Creek formation exposed on public land).

There would be no impacts on the paleontologic resource from wilderness actions.

Wilderness

ZOOK CREEK WILDERNESS STUDY AREA

In the Zook Creek WSA, 4,000 acres containing 173 million tons of coal with development potential would be acceptable for further lease consideration, pending application of the multiple-use screen. The remaining 4,438 acres, containing 291 million tons, would still be deleted from further leasing consideration due to other unsuitability criteria. Within the next ten years, it is very unlikely that mining would occur in this area. No mine plan exists adjacent to the WSA. In the worst case, if all suitable coal were mined in the long term, impacts would be severe. All wilderness values within the WSA would be irreversibly and irretrivably lost, both in the 4,000 acres actually mined and in the 4,438 acres restricted from mining by unsuitability criteria.

Mining is possible within several miles of the WSA. Most likely, impacts would be insignificant. As a worst case (if all acceptable areas were mined), offsite activities would diminish the wilderness characteristics of naturalness and outstanding opportunities for solitude. This would be a significant indirect impact.

There would be a possibility in the long term that oil and gas development on 8,438 acres would degrade the naturalness of the area. This would be a significant impact.

Management of vegetation in Zook Creek, including maintenance of projects, would not impair the wilderness characteristics of the WSA.

There would be no impacts on wilderness characteristics from range developments or surface treatments outside of the WSA.

There would be no impacts on wilderness characteristics from lands actions outside of the WSA, except if public access were gained through land exchanges.

The 25 visitor days of off-road vehicle use per year would continue and have an insignificant impact on the naturalness of the area.

There would be no impact to the wilderness resource due to forest management in the short term. There would be an insignificant impact on the wilderness characteristic of naturalness from incidental post and pole cutting in the long term.

Summary

Zook Creek would retain its wilderness characteristics in the short term. The naturalness characteristic might be degraded in the long term due to possible coal, oil, and gas development.

The opportunity to expand the diversity of the National Wilderness Preservation System by designating an example of the Great Plains short grass prairie eastern ponderosa pine ecosystem would be foregone, as there are no such examples currently in the system.

BUFFALO CREEK WILDERNESS STUDY AREA

In the Buffalo Creek WSA, the area would be acceptable for further consideration for coal leasing pending further study and application of the multiple-use screen. In the short term, coal leasing and mining of the area is unlikely and therefore no effects on the wilderness characteristics are expected. However, as a worst case, 55 million tons on 5,650 acres would be mined and the wilderness characteristics would irreversibly and irretrievably be lost.

Mining is possible within several miles of the WSA. Most likely, impacts would be insignificant. As a worst case (if all acceptable areas were mined), offsite activities would diminish the wilderness characteristics of naturalness and outstanding opportunities for solitude. This would be a significant indirect impact.

There would be a possibility in the long term that oil and gas development on 5,650 acres would degrade the naturalness of the area. This would be a significant impact.

Management of vegetation in Buffalo Creek, including maintenance of projects and the construction of two miles of fence, would not impair the wilderness characteristics of the WSA.

There would be no impacts on wilderness characteristics from range developments or surface treatments outside of the WSA.

There would be no impacts on wilderness characteristics from lands actions outside of the WSA, except if public access were gained through land exchanges.

The 150 days of off-road vehicle use per year would continue and have insignificant impact on the naturalness of the area.

There would be no impact to the wilderness resource due to forest management in the short term. There would be an insignificant impact on the wilderness characteristics of naturalness from incidental post and pole cutting in the long term.

Summary

Buffalo Creek would retain its wilderness characteristics in the short term.

Coal or oil and gas development, if it occurred, would degrade the wilderness characteristics of naturalness in the long term.

The opportunity to expand the diversity of the National Wilderness Preservation System by designating an example of the Great Plains short grass prairie eastern ponderosa pine ecosystem would be foregone, as there are no such examples currently in the system.

Lands

There would be no impacts on the lands resource resulting from coal mining, vegetation management or wilderness actions.

Exchanges of 123,542 acres would result in a significant increase in management efficiency and public use by consolidating isolated inaccessible tracts, acquiring access to bodies of water and large tracts and acquiring land or easements for preservation of cultural, historical, paleontological and recreational sites. This action would reduce administrative costs for maintaining these small, isolated tracts and retain a balance of natural resources. Sales of isolated, inaccessible tracts would result in an irretrievable loss of 41,181 acres from public ownership. However, these lands are inefficient to manage and are unusable by the public. Therefore, the impact would be minimal. Disposal under the Recreation and Public Purposes Act results in a significant beneficial use by the public.

Summary

There would be no impacts from coal mining, vegetation utilization and wilderness actions. There would be a significant beneficial impact from land transactions.

Recreation

If all areas were mined, 38,000 acres near the Tongue and Powder Rivers having scenic value and 200 acres having local historical value (Battle of Hanging Woman Creek) would be irreversibly and irretrievably lost. Because of the loss of hunting opportunities on up to 993,591 acres during mining and reclamation, there would be additional hunting pressure on surrounding private and public lands. These would be significant impacts. However, after successful reclamation the latter would be an insignificant impact. About 84.5% of all federal coal with development potential lies under private surface, and recreational use is governed by the surface owner. Any additional limitations on the general public because of mining would be insignificant.

The 300 additional reservoirs and pits would improve hunting potential through the dispersion of wildlife and would increase the fishing resource. The 50 two-mile sections of fence would inconvenience hunters by restricting their movements. This would be an insignificant impact. Mechanical treatment of 125,023 acres would result in localized short term reductions in hunting habitat, which would be an insignificant impact in the long term.

Recreation, especially hunting and wildlife observation, would benefit from the woody riparian vegetation management techniques. The control of prairie dogs and noxious weeds, and prescribed burning would result in no impacts.

The sale of 11,789 acres in the short term and 41,181 acres in the long term would result in an insignificant impact to recreational opportunities, because these lands are generally isolated from the public due to the lack of access. The exchange of 35,369 acres in the short term and 123,542 acres in the long term would allow public land to be blocked up, and access gained to isolated tracts and bodies of water. Also, exchanges would aid the Montana Department of Fish, Wildlife and Parks in meeting its objectives of gaining access to bodies of water, access to public land for hunting purposes, and continued blocking up of public land at or near significant historical sites. Increased access to public lands and bodies of water would aid the BLM in meeting the long term demand for recreation. Therefore, exchanges would have significant beneficial impacts. Recreation would benefit from Recreation and Public Purpose actions. However, the resource would be managed by agencies other than the BLM.

Recommending Zook Creek and Buffalo Creek WSAs as nonsuitable for wilderness designation would have no impacts on recreation. Current use is generally for hunting, which would continue. In the long term, recreational use would have the potential for expansion with the continued opportunity of off-road vehicle use.

The scenic values of these areas would be irreversibly and irretrievably lost due to coal mining. In relation to the surrounding area, this would be an insignificant impact.

Summary

The cumulative impacts of coal mining actions on recreational opportunities would be significant. The vegetation utilization and wilderness actions would result in insignificant impacts. There would be significant beneficial impacts from land actions.

Air Quality

Concentrations of total suspended particulate (TSP) would be elevated in the vicinity of any mining activity. Depending on the situation, average annual concentrations of TSP at the mine area boundary would range from 20 to 90 mg/m^3 and second highest 24-hour concentrations would range from 75 to 260 mg/m^3. These concentrations would fall back to one mg/m^3 above baseline levels at a distance of two to nine miles from the active mine area, in worst case situations (PEDCo SSAs 1983). Under the worst case situation, mining could occur to the degree that adjacent mines would be close enough to each other that their emissions would be cumulative. Cumulative emissions from adjacent mines would violate the state 24-hour ambient air quality standard of 200 mg/m^3 in some cases. Increases in particulate and gaseous pollutants would be a phenomenon that would be insignificant, except in the immediate vicinity of active mining. Successful land reclamation would eliminate degradation of air quality. Impacts resulting from the proposed action would be limited to degradation of air quality and insignificant climatological changes during mining and reclamation.

Increments of TSP are not consumed by mining, under the Prevention of Significant Deterioration (PSD) ruling, unless the mining occurs within a designated impact area of a major polluting source. There are no such impact areas for TSP in the resource area now, consequently no mining activity will consume TSP increments either in the resource area or in the Northern Cheyenne Indian Reservation Class I area. Mining could affect air quality related values (AQRV) on the Class I area. The AQRV most likely to be affected by mining would be visibility. The visibility reduction modeled for the closest proposed coal tract to the Reservation was an imperceptible and insignificant 0.7 percent.

Fugitive dust generated by wind erosion on the moderate to severely susceptible soils has elevated TSP to an average background concentration of 15 mg/m^3; this would continue on a long term basis. Land treatments increase surface exposure and raise fugitive dust concentrations to about 30 mg/m^3 over the short term, until vegetation is well established. Increased vegetative production would have a positive effect on reducing fugitive dust generation from wind erosion. There would be a 27.3% reduction in TSP for 14.8% of the land area, resulting in a concentration for those lands of about 12 mg/m^3.

Meteorological conditions, such as inversions, sometimes permit high concentrations of particulate matter to accumulate in localized areas. However, they are small in scale and quickly dispersed. In the long-term, land treatments would enhance air quality by reducing TSP concentrations to about 10 mg/m^3 for range in excellent condition. Chemical control of noxious weeds could produce very localized, short term, virtually unmeasurable impacts to air quality by drifting in and around the treatment areas. Prescribed burning would elevate the concentration of airborne particulate matter in localized areas over the short term. Concentrations of particulates eight hours after the burn would be on the order of 500 mg/m^3 and this would be reduced to 20 mg/m^3 above background within 24 hours of the burn. Impacts from all the described activities are considered insignificant in that they rarely, if ever, result in the violation of standards. Certainly no irreversible commitment of the air resource is posed by these land management practices.

Lands involved in sales or exchanges could be formed once they come under private ownership. These actions would only contribute minimally to air quality impacts currently being experienced. Otherwise, there would be no impacts on air quality as a result of lands actions.

Fugitive dust, generated by wind erosion on moderate to severely susceptible soils, would not deteriorate air quality from present levels at Zook Creek and Buffalo Creek. Degradation of air quality in the long term from any energy development would be limited to acceptable levels by state and federal standards and would not threaten the current air quality in the WSAs.

Summary

Coal mining actions could affect AQRV on the Northern Cheyenne Indian Reservation, a Class I area. The AQRV most likely to be affected would be visibility. Cumulative emissions from adjacent mines could violate state 24-hour ambient air quality standards at times. Impacts from any vegetation management proposals would be insignificant in the short term and would be beneficial in the long term. No impacts to air quality would be experienced from lands actions except where lands are developed for farming. Wilderness actions would have insignificant impacts on air quality.

Forestry

Approximately 49,140 acres of commercial and noncommercial (woodland) forest land on public surface would be irreversibly and irretrievably lost if all areas were mined. This assumes that there continues to be no proven reclamation techniques that can successfully reestablish ponderosa pine forests on previously mined land. This figure is 37 percent of the total amount of BLM administered forest land and represents six percent of the total federal and Indian forest lands in the Resource Area. Since the Resource Area has no established allowable cut, the loss of public forest land would not impact the Bureau's forestry program during mining and reclamation or after reclamation. However, the amount of Bureau forest resources available for incidental sales of firewood, Christmas trees, sawlogs and posts and poles would be significantly reduced. In addition, the loss of forest cover would significantly affect other Bureau programs, especially wildlife and recreation. Approximately 90,850 acres of forest land on private surface over federal coal would be lost if all areas were mined. The impacts due to the loss of private forest land would be essentially the same as the loss of public forest land. The cumulative impacts from the combined loss of public and private forest lands would be insignificant to the forest products industry.

There would be no impacts to the forest resource from any of the vegetation utilization actions.

A maximum of 17,686 acres of commercial and noncommercial (woodland) forest land would be removed from public ownership because of sales or exchanges where no similar land is acquired. This figure is 13 percent of the forest administered by the BLM and represents two percent of the total federal and Indian forest. Exchanges would be emphasized over sales. Therefore, it is doubtful that the above figure would accurately reflect the loss of forest acreage from public ownership.

In the event that the maximum amount of forest land (17,686 acres) is removed from public ownership, the Bureau's forestry program would not be impacted, since the Resource Area does not have an established allowable cut. However, the amount of forest resource available for incidental sales of firewood, Christmas trees, sawlogs, and posts and poles would be reduced, perhaps significantly in some areas.

There would be a small positive impact in the long term, since the wilderness study areas would be open to a wider range of forestry management options, including post and pole sales.

Summary

Cumulative impacts on the forest products industry would be insignificant, because the impacted forest lands are not of high quality and are not in demand. However, a significant amount of public and private forest land would be irreversibly and irretrievably lost due to coal mining. A lesser amount of public forest would be made unavailable due to land pattern adjustments. There would be no impacts from vegetation management and wilderness actions.

Agriculture

If all areas were mined, 47,301 acres currently utilized as cropland would be affected. Maximum annual loss during mining and reclamation would be 1,267,667 bushels of winter wheat or 66,221 tons of alfalfa hay. These losses would not have a significant effect on regional agricultural production, however, individual operators could be significantly impacted.

Annual soil disturbance from mining (600 to 1,000 acres) at current and projected rates of production would not exceed that acreage presently left bare annually due to summer fallow (2,000 to 2,500 acres) in the areas of coal with development potential. Preliminary indications from completed and ongoing reclamation research are that impacts after reclamation are not significant, since agricultural productivity of mined land can be restored (Gilley et al 1982, Pole et al 1979, Power et al 1981).

Vegetation utilization actions would have no impact on agriculture.

Sale or exchange of 164,723 acres could include some or all of the 637 acres of public land currently utilized as cropland and tame pasture. There are 14,619 acres in the short term and 51,064 acres in the long term that have a potential to be plowed under in land capability Classes of III and IV.

There would be no impacts from wilderness actions, because there is no agricultural use in the WSAs.

Summary

The cumulative impact would be insignificant. However, coal mining actions could have a significant impact on some individual operators. Land actions could have a beneficial impact on some individual operators.

There would be no impacts from vegetation utilization and wilderness actions.

Economics

This alternative identifies additional coal that has not been identified in previous planning. Impacts from developing any of this additional coal would be in addition to those impacts identified in previous planning. See Tables 4-6 through 4-16.

Since there have been no expressions of interest by industry and tracts have not been delineated, it is not possible to identify where and when coal would be leased and mined. After a potential mine area has been identified by industry, tract profiles, a regional EIS and permit EISs must be written. They would provide community leaders and planners with more accurate information to properly plan for impacts.

Coal is available for further consideration for leasing in the areas north, south and east of the Northern Cheyenne Reservation. (See Preferred Alternative Map in map folder.)

The impacts from mining additional coal that have not been identified in previous planning would affect each of these areas differently.

If additional coal is mined north of the Northern Cheyenne Reservation, the communities of Hardin, Forsyth and Colstrip would be most heavily impacted. The past experiences of these communities in accomodating coal development would help to minimize these impacts. These communities have much of the necessary infrastructure and primary services in place. Other additional services could be expanded at reasonable costs to support additional growth.

Additional coal development in the area south of the reservation would most heavily impact Bimey, Decker and Sheridan, Wyoming. This area in Montana is sparcely populated and as in the past, miners would most likely reside in Sheridan, Wyoming with little expected growth to Bimey or Decker. Sheridan also has much of the infrastructure and primary services available to support additional growth. Sheridan may be required to go to the Wyoming Legislature for additional funding to support further growth.

The area east of the reservation would have the most difficulty with coping with impacts from additional mining. The communities of Ashland and Broadus in Powder River County to date have not experienced rapid growth from coal development. By the time that the additional coal identified in this document reaches the leasing stage, these communities could be experiencing growth due to development of mines resulting from the 1982 and 1984 Federal coal lease sales and the development of the proposed MONTCO mine.

These communities have not had the experience that communities identified in the north and south sectors have had with coal development. The 1980 population of the communities, Broadus (715), Ashland (approximately 400), are small in comparison to the other impacted communities. Due to their small size, impacts would be relatively greater. These communities also would need to establish lines of communication with State agencies and the Montana Coal Board as have the other impacted communities.

Powder River County does not have an established tax base from coal development as do Rosebud and Big Horn Counties. Consequently, this county may have severe problems supporting this additional impact during the early years of development until tax revenue starts coming in from coal production.

Additional coal development on or near the Northern Cheyenne or Crow Reservations will impact the reservations both postively and negatively. Additional mines may provide additional job opportunities for the Northern Cheyenne and Crow Indians but at the same time will bring more people into the area causing additional disruption to the lifestyle and fiscal requirements of the Indians. The community of Lame Deer would probably receive the greatest impact.

Figures are provided in Table 4-2 for use by community leaders and planners to determine impacts for each additional million tons of coal proposed to be mined. These figures are then used to compute the requirements for a five million ton per year mine in Table 4-3.

The state's share of federal royalties, the state severance tax and the increased county tax valuation are portrayed in Table 4-4. This increased tax valuation only applies to the county and school district where the coal is mined. Plant and equipment is estimated at $5,000,000 per million tons mined. The increased tax valuation would be taxed at the county mill levy and the school district mill levy. Although this increase would help to meet expenditures, there is a one to two-year delay from the time of the initial impact to the time of the collection of additional taxes.

The State Severance Tax Impact fund provides the Montana Coal Board with money to assist impacted areas. This is 8.75% of the severance tax collected on each ton mined. In our example of a five million ton mine at $7.83 (1980 data—Powder River II Coal EIS) per ton, the 30% severance tax would provide $11,745,000 of increased revenue per year. Of this amount, over $1 million plus is available to the Coal Board. Impacted entities must apply to the Coal Board for this money.

Indian reservations and communities can also apply to the Coal Board for impact funds. They must compete with state agencies for this money, which totals seven percent of 8.75%. A five million ton mine would provide an additional $71,938 per year.

In FY 1984, the Office of Budget and Planning for the State of Montana estimates that severance taxes will provide $98,654,000. The impact fund for the Coal Board totals $8,632,000. The seven percent share of this fund for Indian tribes and state agencies amounts to $604,240. These annual figures would increase as production and/or the price of coal increases.

The additional 160,024 acres of public rangeland in good condition could support 25,304 additional AUMs for livestock if needed in the long term and 75,912 AUMs for wildlife, watershed protection and other nonconsumptive uses. The estimated cost of range improvements is $6,405,960, based on the current average cost per improvement. This is equal to an average cost of $6.93 for each AUM gained. Preference values would increase by $2,530,400 (12% increase) on those ranches that would be improved, should the additional AUMs ever be allotted.

Land disposal could affect county revenues because of differences in lieu of taxes (PILT) and county taxes. Impacts would be insignificant.

There would be no economic impact from wilderness nondesignation at either Zook Creek or Buffalo Creek.

TABLE 4-2
IMPACTS TO COMMUNITIES FOR EACH ADDITIONAL MILLION TONS OF COAL MINED

PREFERRED ALTERNATIVE

Workers required	**Wages and Salaries**
46 miners @ $27,980[1]	$1,287,080
45 secondary (construction and all other employment) @ $13,321[2]	599,450
TOTAL 91	$1,886,530
Increased wages and salaries	$1,886,530
Population Increase See Appendix O for Methodology	119
School children 1/4 of population	30
Housing unit requirements	51

Increased Taxes To State

Severance Tax
$7.83 price per ton[3] x 30% x 1,000,000 tons = $2,349,000 per year

Coal Board share for impacts
$2,349,000 x 8.75% = $205,538 per year

Increased tax valuation for counties
Taxable valuation of plant and equipment = $5,000,000

Gross proceeds tax valuation for counties
(price per ton x 45% x tons mined)
$7.83 x 45% x 1,000,000 tons per year = $3,500,000

YEARLY TOTAL = $8,500,000

Other Requirements

Fire fighters (volunteers)
6 per 1,000 population

Water capacity
400 gallons per person per day

Sewage capacity
168 gallons per person per day

Streets and curbs
1.9 mile per 1,000 population
estimated at $250,00 per mile

Hospital beds
4 per 1,000 population

Law enforcement
1.4 per 1,000 population

20 acres per MM acres disturbed/tons/yr = 4 AUMs per year lost
Value lost at $400 per AU = $133

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1. 1980 salaries and wages for miners for Big Horn, Powder River and Rosebud Counties; Employment Security Division, Mont. Dept. of Labor and Statistics.
2. 1980 average salary for Big Horn, Powder River and Rosebud Counties; Employment Security Division, Mont. Dept. of Labor and Statistics.
3. Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM.

TABLE 4-3
PROJECTED REQUIREMENTS FOR A 5-MILLION TON PER YEAR MINE

PREFERRED ALTERNATIVE

Workers Required	
Miners	230
Secondary employment (all other)	225
TOTAL	455
Population increase	595
School children	150
Housing Requirements	$255
Increased Taxes To State:	
Severance tax to state	$11,745,000
Coal Board share for impacts	$1,027,690
Increase Tax Valuation To County	$42,500,000
Fire fighters	3
Increase water capacity	238,000 gals per day
Increase sewage capacity	99,960 gals per day
Hospital beds	2
Law enforcement	1
Streets and curbs	$285,000
Acres disturbed from mining per year	100 acres
AUMs lost per year	20
Value of AUMs lost	$665

TABLE 4-4
ADDITIONAL TAXES COMPUTED FOR EACH ADDITIONAL FIVE MILLION TONS MINED AT A CONTRACT SALE PRICE OF $7.83 PER TON

PREFERRED ALTERNATIVE

Federal Royalties	$4,893,750
State's Share of Federal Royalties (50%)	2,446,875
State Severance Tax (30%)	11,745,000
Impact fund share of severance tax (8.75%)	1,027,688
Portion of Impact fund available for Indian tribes and state agencies (7% of impact fund)	71,938
County Increased Tax Valuation	
Gross proceeds tax (45% x price x Tons Mined per year)	3,523,500
Mine plant and equipment	
Estimate $25,000,000 (11%)	2,750,000
Total increased tax valuation	$6,273,000

This increased tax valuation is taxed at the county mill levy and at the school district mill levy.

Estimated Values of Severance Tax for FY 1984	$98,654,000*
Value of impact fund (8.75%)	8,632,000*
Value of Indian tribe and state agency share of impact fund	604,240*

SOURCE: *Office of Budget Program Planning, State of Montana

Social Impacts

If the coal market were to improve and much of the coal identified for lease consideration were developed, the region's economic base could change greatly. The region's economy could become clearly dominated by coal development, with agriculture playing a reduced role. This would have important impacts in the social make-up and structure of certain communities and counties. The rural communities would lose their close-knit, face-to-face informal social interaction and this would be replaced with more formal mechanisms of integration. Growth tends to lead to increasing bureaucratization of social structures, and many social relationships may change from personal to impersonal (Kremmling RMP 1983). Agricultural customs and culture could be replaced by more urban forms. Newcomers from the coal industry could fill many political seats once occupied by ranchers.

If much of the coal acreage considered acceptable for further study were developed, there would be significant social impacts in Powder River, Big Horn and Rosebud Counties. Significant impacts would be experienced in Broadus, the Ashland-Otter Creek-Bimey area, Forsyth, Colstrip, Hardin and Sheridan due to the magnitude of population increase. Social organization, integration and services would be severely impacted. Powder River County, instead of continuing to lose population through out-migration, would gain population through in-migration. Young people from the county would be more inclined to stay because there would be more employment opportunities for them. There would be more employment opportunities for people in Custer and Treasure Counties as well. This would change the existing demographic profile in Custer and Treasure Counties and increase the proportion of the population in the 18 to 45 age bracket.

Under a maximum coal development scenario, both the Northern Cheyenne and Crow reservations could be affected. The development of new mines within commuting distance of the reservations could help solve an important social problem of both tribes, unemployment. There would be trade-offs involved. A large population influx of non-Indians living in proximity to either reservation could substantially increase the Native American cross-cultural contact, increasing cultural disintegration. As Native American communities, the Crow and Cheyenne are inherently more vulnerable to industrialization than are predominantly white communities. Also, the Crow and Cheyenne seem to value an unspoiled physical environment very highly. Their relationship to their physical surroundings seems to be an important part of their cultural heritage (Northern Cheyenne Planning Office). Depending on the size, timing and location of the mines, environmental degradation could occur near the reservations.

The worst case coal development is an unrealistic scenario given current market conditions. Most likely this alternative would cause few additional impacts other than those outlined in Alternative A. Most likely, this alternative would give the coal industry more flexibility in where to develop coal tracts rather than adding drastically to the total coal mined.

The effect of this alternative would be to make development more likely for certain areas that would not be open for development under Alternative A.

This preferred alternative opens up coal for lease consideration in the Pine Hills area, which is approximately 10 to 15 miles east of Miles City. A mine, if developed there, would probably produce two million tons per year or less. Given that Miles City is already a main service center for the Resource Area, it is expected that social impacts to the community would be insignificant. A small mine would probably add a needed employment base without causing a drastic population increase. Miles City is socially a much more diverse community than many other communities and has more potential for handling added growth. Even if the Pine Hills area were not mined, Miles City would continue to grow in importance as a service area for surrounding coal development. Miles City has a city-county land use planning office and a comprehensive plan to help guide future developments.

Another area opened up for lease consideration in this alternative is the Pumpkin Creek area, approximately 20 miles west of Broadus. Development of a mine in this area may certainly increase potential social and services impacts on the Broadus community. The lack of recent land use planning efforts makes Broadus potentially vulnerable to effects from rapid growth from coal development. Town and county officials seem to be taking a wait and see approach to potential coal development.

Another area opened for lease consideration under this alternative is the Terrett Ranch, which is north of Cook Mountain. This area may have a good possibility for development if the Tongue River Railroad is built. This area is approximately 15 miles north of Ashland and 25 miles east of Colstrip. If developed, this area could add further population impacts to Ashland and Colstrip.

There is a good possibility that the general social well-being of ranchers who use BLM land for grazing would be improved, because range conditions would be improved.

Depending upon the situation, whether the lands are sold or exchanged, there is a potential for both increasing and lowering the social well-being of certain ranchers who use BLM land for grazing. There is the potential for increasing the operator's social well-being if he gains BLM land through sale or exchange. This may increase the operator's control over land he may have used for years. Another positive social benefit may be to local governments and communities in accruing more taxes from these isolated tracts.

One social consideration has to do with futures foregone. Land use decisions not only affect present land use, but also help shape decisions that are possible for the future. Other things being equal, a decision that restricts future options is socially less desirable than one which leaves future choices open. In this context, land pattern adjustment may be a more flexible approach in leaving future choices open than the other alternatives. Under this alternative, the total amount of acreage the BLM oversees will remain about the same. Most likely, as a future option, it would be easier to sell BLM land than to buy the land back if needed. It is quite feasible as resources become more scarce that federal land will continue to increase in value, not only fiscally but as a recreational and social resource. The greater flexibility of this alternative is also apparent in that it provides for substantial exchange of lands to improve recreational and wildlife values and to block up public land for better management.

Sale as a method of land disposal may have more potential for negative impacts. If land adjacent to current operators is sold, even under modified bidding procedures, the operator may not be able to afford to purchase the land. BLM land sales may have more potential for negatively impacting the small rancher or those with heavy debt loads, than the larger, wealthier ranchers.

Exchange as a land disposal practice may have less likelihood of inequitable impacts. There is still the possibility that if land adjacent to current operators is exchanged to someone else, it may harm the operator's ranching operation. Three-way trades or land exchange pooling may somewhat mitigate this possibility. If exchanges are used to improve access to public land, regional recreational and hunting opportunities would be enhanced.

There would be minimal social impacts resulting from wilderness actions.

Coal

A maximum of 11.26 billion tons of coal with development potential, plus any additional coal mined as a result of emergency leases, would be irretrievably and irreversibly lost by mining. It is anticipated that the demand for coal in the future will be less than the total available. Many areas cleared in planning would not be delineated into tracts for possible leasing. Also, it is highly unlikely that all coal with development potential would be mined, because currently, coal companies rarely extract coal under more than 200 feet of overburden, whereas coal with development potential has up to 500 feet of overburden.

Exchange of coal for coal in alluvial valley floors and through legislative dictums could remove a significant amount of coal from development potential status. These exchanges may compensate the federal government by providing resources other than coal to the public.

There would be no impacts to the coal resource from vegetation utilization actions. It is possible that some of the 4,480 acres identified for sale or exchange could occur in areas with unknown coal potential.

Impacts could occur to the availability of the coal resource, if sale or exchange of the surface permitted the new surface owner to deny consent to mine underlying federal coal. However, due to the small acreage being considered, impacts would be insignificant.

Wilderness actions would have no impact on the coal resource.

Summary

There would be significant impacts from coal mining, no impacts from vegetation management and wilderness actions and insignificant impacts from land actions.

Other Minerals

No oil or gas fields lie within coal areas identified as suitable; therefore, no impacts are expected to occur in the short term. Long-term impacts are unknown. The only other known mineral resources of note in the coal areas are clinker and sand and gravel. Because they are very abundant, conflicts with coal actions are expected to be insignificant, in the short and long terms.

There would be no impacts on other minerals from vegetation utilization actions.

Disposal of the surface estate over reserved oil and gas minerals would have the impacts of: (1) reducing the BLM workload of checking reclamation from seismic exploration, and (2) complicating the permitting process for the lessee, since an additional participant (the surface owner) besides BLM would be involved. These impacts would not be significant.

There would be no impacts on claimed locatable minerals, since lands with mining claims recorded under Section 314 of FLPMA are prevented from exchange or sale. Disposal of the surface estate would prevent unclaimed locatable minerals from being claimed and recorded, pending regulations issued by the Secretary of the Interior. The resulting impacts would not affect BLM, since the federal government receives no royalties from locatable minerals, but impacts would occur to private mining parties who lose access to potential mineral resources. This could involve some of the 4,480 acres identified for sale and exchange, but the small acreage involved would be insignificant.

Disposal of the surface estate would not affect BLM ownership of underlying mineral materials. A 1983 U.S. Supreme Court decision affirmed public ownership of sand and gravel on lands where the surface only was patented. Mineral entry rights would be preserved.

There would be no impacts on the availability of Zook Creek and Buffalo Creek WSAs for oil, gas, or geothermal leasing, location of mining claims, or material sales, since both areas would be recommended as nonsuitable for wilderness designation.

Summary

Impacts from coal mining and land actions would be insignificant. There would be no impacts from vegetation utilization and wilderness actions.

Range

If all the area were mined, there would be an approximate loss of 26,200 AUMs during mining on public and private surface.

The most serious effect on vegetation after reclamation would be the irretrievable and irreversible loss of the natural vegetative mosaic and species diversity on all 131,091 acres. However, vegetation production may be better after mining, due to extensive reclamation work. No acreage identified as needing range improvements overlaps with areas acceptable for further coal leasing consideration.

Current vegetation utilization for livestock of 208,083 AUMs and grazing management would continue to be maintained at current levels on the 1,080,675 acres. Range condition would not be expected to change.

The overall effect of the proper application of mechanical treatments on 4,500 acres over the long term would be an improvement of range condition and a 100% increase in vegetation production. Maintaining and replacing structural range improvements would reduce available forage by 1,560 AUMs during construction, but would maintain the overall condition of the allotments by providing for even distribution of livestock and utilization of forage.

The 12 functional AMPs would have no new impacts on vegetation production. As 15 nonfunctional AMPs become more functional, there would be an increase in plant vigor and species diversity due to possible changing of grazing systems. However, because of the relatively small number of acres totaling 24,426, there would be an insignificant increase in range condition.

The wildlife projects that would be constructed would have no impact on vegetation production. Improved management, range improvement placement and use supervision would result in improvement of 5,000 acres of riparian areas to a healthy woody riparian condition. All age classes of trees would be represented with 30% or more of the stand being sapling or younger. Reduced use of riparian zones as forage areas and shade sources for livestock would result in an increase in cover and plant community structure and health.

Control of 40 acres of prairie dog towns would have an immediate effect of improving vegetative production and range condition. Production would increase 100% because of improved plant vigor and the transition of the plant community from low to high producing species. Increased vegetation, shade and litter would increase site moisture retention and improve plant growth conditions.

Control of 130 acres of noxious weeds would result in up to a 200% increase in range condition through increases in desirable plant species, useful vegetation production and improved soil protection.

The short-term effect of prescribed burning on 20 acres and 500 acres burned from wildfires would be a loss of all forage being produced on the site. The long-term effect, depending on the range site, would be a 50 to 70% increase in livestock forage through recovery of more desirable plant species.

Vegetation Utilization—Livestock

Current utilizations would not affect livestock. Livestock stress, due to moving livestock between pastures, would increase slightly on present functional AMPs and on the AMPs that would become functional. Reliable spring livestock forage and cover for young calves would be provided in grazing systems. Livestock breeding success would be maintained by fencing, which would create closer stock confinement.

Land treatments would increase the overall forage base for livestock. Livestock distribution would improve slightly because of treatments and range improvements. There would be no significant impact to livestock.

There would be a short-term loss of 40 AUMs and a long-term loss of 128 AUMs from land sales. The sale of these tracts would result in reduced grazing administration costs.

There would be a short-term loss of 192 AUMs and a long-term loss of 768 AUMs from land exchanges. This loss of AUMs could be offset by similar or greater vegetation production in lands gained from exchanges. Exchanges which consolidate tracts of public land would result in more efficient grazing administration. Lands disposal through R&PP actions would have no significant impact on the range resource. Recommending Zook Creek and Buffalo Creek as nonsuitable for wilderness designation would have no impact on the range resource.

Summary

Cumulative impacts on vegetation would be significant from coal mining and insignificant from vegetation utilization, lands and wilderness actions. By continuing current range management, 70% of the rangeland would remain in good or better range condition.

Hydrology

Coal—Surface Water

Impacts to surface water quantity from coal mining are expected to be insignificant during mining and reclamation. Streamflow downstream of the mine sites would be retarded and possibly reduced by sedimentation ponds on the minesite. The overall effects would be to reduce flood peaks and slightly reduce streamflows. Surface runoff and associated peakflows would probably increase by approximately five percent, due to the decreased infiltration capacity of spoils immediately following reclamation (Arnold and Dollhopf 1977). Dollhopf (1979) predicts that the infiltration would improve as root systems develop and become similar to native rangeland. It is estimated to take 10 to 15 years to regain prior infiltration capacity. The net long-term effect of mining on surface water quantity would be insignificant.

Impacts to surface water quality are also generally expected to be insignificant during mining and reclamation. State regulations limit amounts of suspended solids, iron, manganese, and acidity in waters discharged from mined land. Monitoring is required to assure compliance. Impacts could be significant in isolated areas where groundwater from a mining area is the major contributor to the surface water drainage. In such areas, water would probably remain suitable for stock use, but not for agriculture. During mining, increased sediment loading from disturbed areas would be trapped by sedimentation ponds. After mining, sediment and water yields would be reduced by 53 ac ft/yr and 2,530 ac ft/yr, respectively, assuming reclamation and revegetation are successful (Table 4-5).

TABLE 4-5
SUMMARY OF WATERSHED IMPACTS
ALTERNATIVE A

Element	Sediment Yield (ac ft/yr) Initial	Sediment Yield (ac ft/yr) Long Term	Water Yield (ac ft/yr) Initial	Water Yield (ac ft/yr) Long Term	Surface Water Quality Long Term	Groundwater Quality Long Term
Grazing Treatments	852	842	29,144	28,938	+	0
Mechanical Land Treatments	18	I	567	I	+	0
Fences	3	7	117	204	—	0
Water Developments (wells, springs, res.)	I	I	I	I	0	0
Fire	1	I	43	I	+	0
Chemical Treatments						
Noxious weeds	10	5	311	183	+	0
Prairie dogs	3	2	96	56	+	0
Riparian Areas	14	1	468	137	+	0
Coal Mining	158	105	7,989	5,459	—	—
TOTAL	1,059	955	39,735	34,977	+	—

I — insignificant
+ — increase
0 — no change
— — decrease

SOURCE: Omang, Parrett, and Hull 1983, BLM 1983 and Appendix I

After reclamation, groundwater discharging from mined areas and carrying an increased salt load from leaching would add significantly to the salinity of nearby springs, seeps, and intermittent streams. The degree of increase depends on the geology of the area, but general increases of 500 to 2,000 mg/1 TDS can be expected (MDSL and OSM 1983). Rahn (1976) found these increases typically were sulfates, calcium, magnesium, and bicarbonates. Van Voast et al (1978) speculates that most materials available for dissolution in the reclaimed spoils would be flushed with the first pore volume of water. However, in dry climates, such as found in eastern Montana, this process may take hundreds to thousands of years. In a practical sense, the impacts would be cumulative from all mined areas where salts were not flushed. Van Voast and Thompson (1982) have shown that no single mine can cause significant impacts to the Tongue River's quality or rate of flow. It is the cumulative effects from several mines which have the greatest chance of impacting a region's water resource. Estimates made by Van Voast for cumulative effects caused by nine active or proposed mines in the vicinity of Decker, Montana, show that post-mine groundwater reaching the Tongue River would increase its median dissolved solids content from 480 mg/1 to 510 mg/1.

A USGS modeling study (Woods 1981) predicts that Tongue River salinity would increase four to five percent following strip mining of 120,000 acres of federal land in southeastern Montana. This is less than one-tenth the increase caused by withdrawal and return flow of irrigation water. These results indicate that long-term regional effects from cumulative mines would not be significant in the Tongue River, but could be significant in smaller streams where groundwater from mined areas contributes a larger percentage of total surface water flow.

Coal—Groundwater

During mining, impacts to the local groundwater would be significant. Aquifers in the overburden and coal would be disrupted. Springs, seeps, and shallow wells in the immediate mine area would dry up or experience lowered water levels. Drawdown in wells caused by mining has been observed to extend from less than one-half mile to three miles (Hardaway and Kimball

1979; Van Voast et al 1978; Dollhopf et al 1978). The influence would vary with the direction of groundwater flow and would be greater in the down gradient direction (Van Voast et al 1977). After reclamation, impacts would be mitigated as the coal seam and overburden aquifers are replaced by a spoil aquifer. Depth and flow of groundwater in spoils would not differ greatly from conditions in undisturbed coal aquifers, but it may take several years for water levels to recover (Van Voast et al 1978).

According to Hardaway and Kimball (1978), a variety of professionals indicate that impacts are not significant on groundwater quality during mining. A mine acts as a sink for groundwater and precludes any possible flow of contaminants into the groundwater system. Water intercepted during mining is pumped into holding ponds and discharged only in accordance with state regulations. Seepage from holding ponds has impacted downstream areas in isolated cases. Impacts can be mitigated by diligent pond construction methods.

In reclamation, overburden is used to refill the pits, thus exposing new surfaces to invading groundwater. These fresh surfaces contain significant quantities of leachable salts and minerals that readily dissolve. Thus, groundwater in mined areas shows increases in dissolved solids. The spread of pollutants from reclaimed areas is difficult to predict. Van Voast (1980) and Ahern and Frazier (1981) state the areal extent is modified by sorption, chemical precipitation, and dilution, and may be limited to a few hundred yards from pit boundaries. Other studies (Rahn 1976 and Moran et al 1976) suggest this spread may extend several miles downgradient from pit boundaries.

Coal—Hydrology Summary

Present and anticipated levels of coal mining indicate that regional impacts to surface and groundwater resources from coal mining would be insignificant. However, in localized areas there would be significant impacts to groundwater quantity during mining and reclamation. These impacts would not be irreversible or irretrievable. Significant impacts to groundwater quality in localized areas would occur and would be both irretrievable and irreversible. In the worst case situation, regional groundwater quality degradation would occur and persist for hundreds to thousands of years.

Vegetation Utilization—Hydrology

Construction of range improvements such as fences would result in increased sediment and water yields of four ac ft/yr and 87 ac ft/yr, respectively. The increase would be caused largely by livestock trailing along new fences.

Maintenance or replacement of reservoirs and pits would temporarily disturb soil. Nearly all soil disturbance would be upstream of dams and would not contribute sediment below the dams. Maintenance or replacement of springs and wells would disturb an insignificant amount of soil and would not impact sediment or water yields.

Approximately 300 acres per year would be exposed initially to wind and water erosion from mechanical treatments. However, infiltration would be improved, leading to increased soil moisture and vegetative cover (Wight and Sidoway 1972; Ryerson et al 1980; Saulman 1973; Neff and Wight 1977; Neff 1980). Sediment and water yields would be reduced by 18 ac ft/yr and 567 ac ft/yr, respectively. Mechanical treatment would not occur if holders of downstream water rights would be adversely affected.

Continued development and revisions of allotment management plans would slowly improve watershed condition. Sediment and water yields would consequently be reduced slightly in the long term by 10 ac ft/yr and 206 ac ft/yr, respectively.

Special management considerations for approximately 5,000 acres of riparian areas would result in less streambank erosion and improved water quality (Holechek 1980). Sediment and water yields would be reduced slightly in the long term by 13 ac ft/yr and 331 ac ft/yr, respectively.

Control of 40 acres of prairie dog towns and rehabilitation of the town sites would have an insignificant impact to water resources in the short term. In the long term, the cumulative impact would be to reduce sediment and water yields by one ac ft/yr and 40 ac ft/yr, respectively, a very slight reduction.

High concentrations of noxious weeds force livestock to graze noninfested areas. Consequent reductions in vegetative cover would increase sediment and water yields (Noble et al 1979). Treatment of 130 acres of noxious weeds would result in reductions of sediment and water yields of five ac ft/yr and 128 ac ft/yr, respectively.

Acres burned by either prescribed burns or wildfires would expose bare ground to water erosion. Sediment and water yields would increase very slightly in the short term by one ac ft/yr and 43 ac ft/yr, respectively. Natural revegetation of burned areas in the long term would return sediment and water yields to pre-burn conditions.

Most water source developments would be replacements for existing projects. Therefore, the overall impact of implementing grazing treatments and facilities would slightly improve watershed condition by reducing sediment and water yields by 51 ac ft/yr and 2,228 ac ft/yr, respectively (Table 4-5). Sediment losses would be irretrievable but reversible. No other irretrievable or irreversible losses to water resources would be experienced.

Lands—Hydrology

No significant impacts to water resources would result from land sales or exchanges.

Wilderness—Hydrology

Zook Creek and Buffalo Creek WSAs would be recommended as nonsuitable for wilderness designation. They would not be mined for coal. Nondesignation would have little effect on current land uses, due to the remoteness of the areas. Therefore, insignificant impacts would be expected to water resources. Present levels of man-caused erosion (ORV use) from surface water runoff would be a minimal irretrievable loss, but not an irreversible loss.

Summary

Cumulative sediment and water yields would be reduced by 104 ac ft/yr and 4,758 ac ft/yr, respectively, a slight reduction. Cumulative sediment and water yields would be reduced by 104 ac ft/yr and 4,758 ac ft/yr, respectively, a moderately significant reduction. Significant losses in groundwater quantity and quality would occur in localized areas near mine sites. Mechanical treatments would significantly reduce sediment and water yields. Other vegetative, lands, and wilderness actions would have no significant impacts on water resources.

Soils

Impacts to the soil during coal mining would involve significant increases in erosion and runoff on 131,091 acres. Losses from wind and water erosion would be 5,658 acre feet of soil over the entire area disturbed. Reclamation potential is questionable on 16,000 acres that are in land capability Classes VII and VIII because of topography, depth to bedrock, rock outcrops and steepness of slope. Direct impacts to the soil from mining disturbances would alter the soil structure and porosity. This alteration would affect permeability, infiltration rates, soil-air and soil-water relationships and bulk density. The natural fertility would be reduced by disruption of the nutrient cycle and a decrease in the organic matter content.

Proper replacement of subsoil and topsoil is critical for successful reclamation. Salt migration to the surface after profile reconstruction is possible, increasing the sodium content of the topsoil from its original level. This could decrease plant production and lower reclamation success. If layers of toxic soil material and restrictive layers are replaced lower in the profile than where they were originally found, plant production may be better after reclamation.

In the long term, with proper mitigation, there would be no impacts to the soils resource after reclamation.

This alternative would maintain watershed condition due to existing and ongoing grazing treatments and range improvements. Management of livestock would redistribute grazing away from critical areas such as floodplains, riparian areas and around reservoirs, where possible. These areas are subject to trampling and compaction, which reduce vegetation and increase runoff and erosion.

In addition, the maintenance or replacement of 375 range improvements would maintain the distribution of livestock to utilize upland areas and allow watershed conditions to stabilize.

Approximately 4,500 acres in the 27 AMPs have the potential to be mechanically treated, which would cause a loss of 95 acre feet of soil from wind erosion. Wind erosion would cause 15 acre feet of soil loss from the construction of 255 reservoirs, pits and pipelines and 15 acre feet of soil loss from livestock trampling along 60 miles of new fence lines. Prairie dog control on 40 acres would increase vegetative cover 100% in the long term and reduce runoff and erosion. Noxious weed control on 130 acres would initially kill vegetation, leaving dead plant residue that would help control wind and water erosion. In the long term, the treated areas would have a 200% increase in range condition through an increase of desirable plant species, minimizing erosion hazards.

Prescribed burning on 20 acres and 500 acres burned from wildfires would remove most vegetation, leaving only plant residue in the short term. This would increase the available plant nutrients in the soil, but also would cause accelerated erosion and the loss of organic matter. In the long term, there would be a 50 to 70 percent increase of vegetation over the current production level, which would minimize erosion hazards and offset the short-term soil losses. (See Table 4-5 for sediment yields from water erosion by range improvements.)

In the short term, there would be a disturbance loss of 110 acre feet of soil through wind erosion from project construction. In the long term there would be no significant loss of soil.

The sale of 640 acres would not impact the soils resource except where there may be a change in land use. The type of change made, i.e., agriculture and road or building construction, would determine the amount of erosion. This is expected to be an insignificant loss.

The exchange of 3,840 acres of land would not impact the soils resource if there is not a change of use, since an equal value of lands would be received.

The disposal of lands through an R&PP action would have an insignificant impact on the soils resource if a land use change were to occur.

There would be no significant impacts to the soils resource in Zook Creek or Buffalo Creek WSAs.

Summary

The cumulative loss of soil from coal mining and vegetation utilization actions would be 5,768 acre feet (5,658 and 110 acre feet, respectively). The losses from these activities would be insignificant with proper mitigation. Impacts from land and wilderness actions would be insignificant.

Wildlife

Coal development on all 131,091 acres would result in low to moderate local impacts on wildlife, if mitigation for the loss of wildlife habitat were successful. Wildlife habitat mitigation required under state and federal regulations would limit most impacts to the mining and reclamation phase. As mining occurs, wildlife habitat would be destroyed; that would be a significant impact. Each of the 22 current federal coal leases identifies wildlife concerns, where they occur within each lease.

BLM coal planning prior to 1982 identified 1,619 acres of sharp-tailed grouse, sage grouse and antelope habitat for which mitigation would be required. The 1982 MFP Amendment identified 3,004 additional acres of critical wildlife habitat for which mitigation would be required. This includes sharp-tailed and sage grouse leks and sage grouse and antelope wintering areas.

Total restoration of some habitat types, such as 6,300 acres of steep breaks and woody draws, has not been demonstrated. Areas that are reclaimed would have the potential to produce high quality spring and summer habitat.

During mining, development and increased harassment would cause movement of wildlife species to less disturbed habitats. Increased human activity would result in increased poaching. These impacts would be significant during the mining and reclamation phase.

Species distribution would return to a more natural state with the completion of reclamation. Because it has not been demonstrated that all types of wildlife habitat can be successfully reclaimed, impacts to wildlife would be significant in localized areas even after reclamation activities.

Although no major fisheries would be directly impacted, the watersheds in the potential mining areas do influence water quality of Yellowstone River tributaries. Each of these is important to the local sport fishery, and impacts caused by mining could be significant. Mitigation during and after mining should target potential siltation and water quality and flow problems.

All known threatened and endangered species use areas were eliminated from further lease consideration in the application of unsuitabilty criteria, where inventory was complete. Increased development and human activity would result in increased disturbance of transient threatened and endangered species, including bald eagles and peregrine falcons, which may migrate through developed areas.

Any emergency leases or coal exchanges which may develop under this alternative must be considered on a case-by-case basis, to assure the protection of critical wildlife habitat.

Vegetation utilization of 624,249 AUMs in the short and the long term for wildlife and nonconsumptive uses would have favorable impacts on wildlife. There would be no significant impacts on wildlife during the short term. Mitigation measures and project stipulations on range developments would result in an overall benefit to wildlife.

Mechanical treatments of 4,500 acres would have insignificant impacts on wildlife habitat, because of the small amount of land involved. Vegetation manipulation would alter wildlife population density and diversity in the treated areas. All wildlife would be displaced temporarily. The expected 15% increase in succulent spring grass and forbs would benefit some species seasonally. Increased vegetative diversity would enhance the abundance and diversity of wildlife species. Big sagebrush habitat, critical to antelope and sage grouse survival, would be evaluated on a case-by-case basis to protect that resource.

Since wildlife concerns would be addressed in each of 27 AMPs, impacts from habitat disturbance or destruction would be minimal.

Maintaining or replacing 375 range improvements would displace wildlife temporarily on 496 acres, due to habitat disruption and increased human activity. Developed water sources would be beneficial to wildlife. They would help break up heavy concentrations of livestock at overused watering sites and would provide additional water sources for all forms of wildlife. Care would be used in water development sites to avoid damage to important wildlife use areas such as woody draws.

Repairing or replacing 60 miles of fence would maintain distribution of livestock. Fences would be constructed so as to minimize movement barriers to big game by utilizing standards outlined in BLM Manual 1737. If fences are built in big game wintering and concentration areas, there would be significant short and long term impacts.

Grazing systems which provide spring rest or deferment would improve the quality and quantity of forage, especially forbs, and would make them more available to deer, antelope, bighorn sheep and grouse. The quality and quantity of nongame forage and cover would increase as a result of grazing treatments.

Upland game birds require the residual vegetation usually found in areas of light or no grazing for nesting and winter survival. Through the use of grazing systems or treatments to provide greater distribution of cattle, residual cover in the current low or no use areas would be decreased. However, this would allow for greater vegetation production in the current high use and concentration areas to offset the loss.

Additional residual vegetation and greater vegetative production due to the use of grazing and land treatments would help upland nesting waterfowl. Residual vegetation for nesting and brood rearing would be available near reservoirs and in rested or deferred pastures.

The average annual installation of 20 bird ramps in stock tanks would be beneficial to all small wildlife species that use these water sources. The ramps help prevent the drowning of small animals. The continued construction and placement of an average of 20 bird nest boxes and 10 goose nesting platforms annually would benefit mainly waterfowl, kestrels and bluebirds. The average annual construction of one livestock exclosure around a new pond development would benefit waterfowl by providing undisturbed nesting cover. The continued stocking or restocking of gamefish in two stockponds annually would benefit the general public by maintaining good fisheries. Reservoirs identified as suitable for recreational fishing would be fenced to provide and maintain a quality fishery. A tank, water gap or other means of livestock access to water would be provided.

Maintaining woody riparian reproduction in areas to provide 30% of the woody species as saplings or younger trees would assure continued age class diversity in the system. This would assure the availability of browse for use by wildlife through winter months.

Control of 40 acres of prairie dog towns would further reduce the known prairie dog acreage by 1.5%. There is concern that as this natural habitat is further reduced, the prairie dog and associated species would reach dangerously low population levels, locally as well as regionally.

The treatment of 130 acres of noxious weeds, particularly Canada thistle, would reduce the available food for seed-eating birds. The small acreage treated would have minor impacts on wildlife.

Implementing prescribed burn plans on 20 acres annually and modified for suppression plans would eliminate some dense vegetation. Although some wildlife species do require dense trees or shrubs, extensive areas of dense vegetation could be of greater value to wildlife if it were thinned with scattered openings.

There would be no significant impacts on threatened or endangered species. Each range improvement project would be surveyed for the occurrence of threatened or endangered species; recommendations would be made for appropriate mitigation or project stipulations. Any control of prairie dogs would decrease the potential habitat for black-footed ferrets.

Disposal of 4,520 acres would mean the loss of BLM control on that wildlife habitat. The lands program also offers potential for exchange to gain lands having equal or greater wildlife habitat values which would benefit from public ownership. With 0.3% of the public lands considered for disposal, there would be insignificant impacts on wildlife habitat. Major wildlife concerns would be addressed on a case-by-case basis early in the discussions of any land conveyed by exchange, sale or for recreation and public purposes. Threatened and endangered species habitat would be given special consideration before any land transactions, to avoid adverse impact to threatened or endangered species.

Recommending Zook Creek WSA as nonsuitable for wilderness designation would allow the possible development of ORV use, range improvements and post and pole cutting. In the short term, there would be significant impacts on sharp-tailed grouse leks, turkey winter habitat and critical mule deer range because of local disturbance. Because of the limited acreage involved, the long-term impacts would be insignificant, even with the addition of impacts from oil and gas development.

Recommending Buffalo Creek WSA as nonsuitable for wilderness designation as wilderness would allow possible development of the oil and gas resources, ORV use, range improvements, and post and pole cutting. There would be localized, insignificant adverse impacts to nesting raptors.

The identified environmental consequences on these two specific areas are based on extensive but incomplete inventory data; these site specific consequences cannot be extrapolated to the entire resource area, where the habitat diversity is vastly greater.

Summary

There would be localized significant impacts on wildlife due to destruction and disturbance of wildlife habitat from coal mining actions. The cumulative impacts on wildlife from coal, vegetation, land, and wilderness actions would be insignificant providing that mitigation and reclamation in coal mining areas is successful.

Cultural Resources

Mining of all areas would affect approximately 450 cultural sites. Nearly all areas have been inventoried. Previous evaluations of cultural resources indicate that between 5% and 20% of these sites may be significant and eligible to the National Register of Historic Places. Impacts of coal mining would be minimal once prescribed mitigation in all laws, regulations, and policies pertaining to cultural resource management were followed.

Improved range condition would generally benefit cultural resource sites by increasing ground cover and reducing erosion. However, some developments such as mechanical treatments and burning would destroy the context or structure of a site. Prior to ground disturbing operations, lands identified for improvement would be inventoried for prehistoric sites. Mitigation through existing policies, however, would minimize the impacts of ground-disturbing treatments on cultural resource values.

Lands identified for potential sale, exchange or other disposal action would be inventoried for prehistoric and historic sites. Through existing policies for mitigation, the effects on cultural resource values would be minimal.

There has been no intensive inventory of the cultural resources of either Zook Creek or Buffalo Creek WSA to suggest direct impacts. Sites which could exist in the areas would be subject to the impacts of continued multiple use management. Applying existing mitigation policies would minimize the effects on cultural resources.

Summary

The impacts of all actions on cultural resources would be minimal.

Paleontologic Resources

Impacts on the paleontologic resource by coal mining would be insignificant. Plant and mollusk fossils are widespread and common throughout the mineable portions of the Fort Union and Wasatch formations. No significant fossil localities have been recorded in the cleared coal areas.

Paleontologic resources would be little affected from vegetation utilization actions. Some trampling of signficant localities by livestock would occur. Avoidance or collection of paleontologic material when constructing range projects would occur on a case-by-case basis. Special emphasis would be placed on projects located in the Hell Creek formation to avoid damage to significant localities.

There would be very little effect on the paleontologic resources due to land actions. Any disposal of parcels that lie partly or wholly within the Hell Creek formation would be surveyed for significant paleontologic material and mitigated, if necessary, on a case-by-case basis.

There would be no impacts on the paleontologic resource from wilderness actions.

Wilderness

ZOOK CREEK WILDERNESS STUDY AREA

There would be no impacts on wilderness characteristics in Zook Creek from coal development. There would be no impacts on wilderness characteristics from coal development outside of the WSA.

There would be a possibility in the long term that oil and gas development on 8,438 acres would degrade the naturalness of the area. This would be a significant impact.

Management of vegetation in Zook Creek, including maintenance of projects, would not impair the wilderness characteristics of the WSA.

There would be no impacts on wilderness characteristics from range developments or surface treatments outside of the WSA.

There would be no impacts on wilderness characteristics from land actions outside of the WSA, except if public access were gained through land exchanges.

The 25 visitor days of off-road vehicle use per year would continue and have an insignificant impact on the naturalness of the area.

There would be no impact to the wilderness resource due to forest management in the short term. There would be an insignificant impact on the wilderness characteristics of naturalness from incidental post and pole cutting in the long term.

Summary

Zook Creek would retain its wilderness characteristics in the short term. The naturalness characteristics might be degraded in the long term due to possible oil and gas development.

The opportunity to expand the diversity of the National Wilderness Preservation System by designating an example of the Great Plains short grass prairie eastern ponderosa pine ecosystem would be foregone, as there are no such examples currently in the system.

BUFFALO CREEK WILDERNESS STUDY AREA

There would be no impacts on wilderness characteristics in Buffalo Creek from coal development.

There would be no impacts on wilderness characteristics from coal development outside of the WSA.

There would be a possibility, in the long term, that oil and gas development on 5,650 acres would degrade the naturalness of the area. This would be a significant impact. Management of vegetation in Buffalo Creek, including maintenance of projects and the construction of two miles of fence, would not impair the wilderness characteristics of the WSA.

There would be no impacts on wilderness characteristics from range developments or surface treatments outside of the WSA.

There would be no impacts on wilderness characteristics from land actions outside of the WSA, except if public access were gained through land exchanges.

The 150 visitor days of off-road vehicle use per year would continue and have an insignificant impact on the naturalness of the area.

There would be no impact to the wilderness resource due to forest management in the short term. There would be an insignificant impact on the wilderness characteristic of naturalness from incidental post and pole cutting in the long term.

Summary

Buffalo Creek would retain its wilderness characteristics in the short term.

The naturalness characteristics might be degraded in the long term due to possible oil and gas development.

The opportunity to expand the diversity of the National Wilderness Preservation System by designating an example of the Great Plains short grass prairie eastern ponderosa ecosystems would be foregone, as there is no such example currently in the system.

Lands

There would be no impacts on the land resource resulting from coal mining, vegetation management or wilderness actions.

Sales of isolated, inaccessible tracts would result in an irretrievable loss of 640 acres from public ownership in the long term. Most of these lands are small, isolated tracts unuseable by the public and unmanageable as part of the public land system. Exchanges of 3,840 acres would result in some improvement in management efficiency and public use. Disposal under the Recreation and Public Purposes Act would result in some beneficial uses by the public.

Summary

There would be no impacts from coal mining, vegetation management or wilderness actions. There would be an insignificant impact from land actions, because the amount of acreage involved would be insignificant.

Recreation

Coal mining on all 131,091 acres would remove this land as a recreational resource until it is reclaimed. In relation to the general area, this is an insignificant impact. Because of the loss of hunting opportunities on up to 131,091 acres during mining and reclamation, there would be additional hunting pressure on surrounding private and public lands. However, after successful reclamation, this would be an insignificant impact. About 84.5% of all federal coal with development potential lies under private surface and recreational use is governed by the surface owner. Any additional limitations on the general public because of mining would be insignificant.

Continuation of the current level of grazing management would have no impacts on recreation. The 225 water development projects (reservoirs and pits) to be maintained or replaced would maintain hunting potential through the dispersion of wildlife and would increase the fishing resource. Mechanical treatment of 4,500 acres would be an insignificant reduction to the recreational resource.

Recreation, especially hunting and wildlife observation, would benefit from the woody riparian vegetation management techniques. The control of prairie dogs and noxious weeds, and prescribed burning would result in no impacts.

The sale of 200 acres in the short term and 640 acres in the long term would result in insignificant impacts to recreational opportunities. The lands to be disposed of are generally isolated from the public due to the lack of access. The exchange of 960 acres in the short term and 3,840 acres in the long term, would have significant short-and long-term impacts on recreation. Exchanges would allow public land to be blocked up and access gained to isolated tracts and bodies of water. Also, exchanges would minimally aid the Montana Department of Fish, Wildlife and Parks in meeting its objectives of gaining access to bodies of water, access to the public land for hunting purposes and continued blocking up of public land at or near significant historical sites. Increased access to public lands and bodies of water would aid the BLM in meeting the long-term demand for recreation. Therefore, exchanges would have significant beneficial impacts. Recreation would benefit from R&PP actions. However, the resource would be managed by agencies other than the BLM. Recommending the Zook Creek and Buffalo Creek WSAs as nonsuitable for designation as wilderness would have no impacts on recreation. Current use is generally for hunting, which would continue. In the long term, recreational use would have the potential for expansion, with the continued opportunity of off-road vehicle use.

The scenic values of these areas would be irreversibly and irretrievably lost due to coal mining. In relation to the surrounding area, this would be an insignificant impact.

Summary

Coal mining, vegetation utilization and wilderness actions would have no impacts to recreational opportunities. Land actions would have significant beneficial impacts.

Air Quality

Concentrations of TSP would be evaluated in the vicinity of any mining activity. Depending on the situation, average annual concentrations of TSP at the mine area boundary would range from 20 to 90 mg/m^3 and second highest 24-hour concentrations would range from 75 to 260 mg/m^3. These concentrations would fall back to 1 mg/m^3 above baseline levels at a distance of two to nine miles from the active mine area, in a worst case situation (PEDCo SSAs 1983). Increases in particulate and gaseous pollutants would be a phenomenon that would be insignificant except in the immediate vicinity of active mining. Successful land reclamation would eliminate degradation of air quality. Impacts resulting from the proposed action would be limited to degradation of air quality and insignificant climatological changes during mining and reclamation.

Increments of TSP are not consumed by mining, under the PSD ruling, unless the mining occurs within a designated impact area of a major polluting source. There are no such impact areas for TSP in the resource area now, consequently no mining activity will consume TSP increments, either in the Resource Area or in the Northern Cheyenne Indian Reservation Class I area. Mining could affect AQRV on the Class I area. The AQRV most likely to be affected by mining would be visibility. The visibility reduction modeled for the closest proposed coal tract to the reservation was an imperceptible and insignficant 0.7 percent.

Fugitive dust generated by wind erosion on the moderate to severely susceptible soils has elevated TSP to an average background concentration of 15 mg/m^3; this increase would continue on a long-term basis. Land treatments increase surface exposure and raise fugitive dust concentrations to about 30 mg/m^3 over the short term, until vegetation is well established.

Meteorological conditions, such as inversions, sometimes permit high concentrations of particulate matter to accumulate in localized areas. However, they are small in scale and quickly dispersed. In the long term, land treatments would enhance air quality by reducing TSP concentrations to about 10 mg/m^3 for range in excellent condition. Chemical control of noxious weeds could produce very localized, short-term, virtually unmeasurable impacts to air quality by drifting in and around the treatment areas. Prescribed burning would elevate the concentration of airborne particulate matter in localized areas over the short term. Concentrations of particulates eight hours after the burn would be on the order of 500 mg/m^3 and this would be reduced to 20 mg/m^3 above background within 24 hours of the burn.

Impacts from all the described activities are considered insignificant in that they rarely, if ever, result in the violation of standards. Certainly no irreversible commitment of the air resource is posed by these land management practices.

No impacts to air quality would be experienced as a result of land sales or exchanges.

Fugitive dust, generated by wind erosion on moderate to severely susceptible soils, would not deteriorate air quality from present levels at Zook Creek or Buffalo Creek WSAs. Degradation of air quality in the long term from any energy development would be limited to acceptable levels by state and federal standards and would not threaten the current air quality in the WSAs.

Summary

Coal mining actions could affect AQRV on the Northern Cheyenne Indian Reservation, a Class I area. The AQRV most likely to be affected would be visibility. Cumulative emissions from adjacent mines could violate state 24-hour ambient air quality standards on several occasions. Impacts from any vegetation utilization actions would be insignificant in the short term and would be beneficial in the long term. There would be no impacts on air quality from lands or wilderness actions.

Forestry

Approximately 1,860 acres of commercial and noncommercial (woodland) forest land on public surface would be irreversibly and irretrievably lost if all areas were mined, assuming that there continues to be no proven reclamation techniques that can successfully reestablish ponderosa pine forests on previously mined land.

This figure is 1.5 percent of the total amount of BLM administered forest land and represents less than one percent of the total federal and Indian forest land in the Resource Area.

Since the Resource Area has no established allowable cut, the loss of public forest land would not impact the Bureau's forestry program during mining and reclamation or after reclamation. The amount of Bureau forest resources available for incidental sales of firewood, Christmas trees, sawlogs and posts and poles would be insignificantly reduced.

In addition, the loss of forest cover would insignificantly affect other Bureau programs, especially wildlife and recreation. Approximately 7,020 acres of forest land on private surface over federal coal would be lost if all areas were mined. The impacts due to the loss of private forest land would be essentially the same as the loss of public forest land. The cumulative impacts from the combined loss of public and private forest land would be insignificant to the forst products industry.

There would be no impacts to the forest resource from any of the vegetation management actions. Removal of commercial and noncommerical (woodland) forest land from public ownership due to sales or exchanges, where no similar land is acquired, would be minimal.

Therefore, the reduction in forests available for incidental sales of forest products would be insignificant. This small loss of forest product sales would have no impact on the Bureau's forestry program.

There would be a small positive impact in the long term, since the wilderness study areas would be open to a wider range of forestry management options, including post and pole sales.

Summary

Cumulative impacts on the forest products industry would be insignificant because the impacted forests are not of high quality and are not in demand. An insignificant amount of public and private forest land would be irreversibly and irretrievably lost due to coal mining actions. There would be no impacts from vegetation management and wilderness actions and insignificant impacts from land actions.

Agriculture

If all areas were mined, 8,938 acres of Class III through IV land currently utilized as cropland would be affected. In addition, 600 acres of Class VI and VII land best suited for native grassland but currently utilized as cropland would be affected. Maximum annual loss during mining and reclamation would be approximately 255,618 bushels of winter wheat or 13,353 tons of alfalfa hay, if all cropland were mined at once. These losses would not significantly reduce regional agricultural production; however, individual operators could be significantly impacted.

Annual soil disturbance from mining (600 to 1,000 acres) at current and projected rates of production would not exceed that acreage presently left bare annually due to summer fallow (2,000 to 2,500 acres) in the areas of coal with development potential. Preliminary indications from completed and ongoing reclamation research are that after reclamation, impacts are not significant, since agricultural productivity of mined land can be restored (Gilley et al 1982; Pole et al 1979; Power et al 1980).

Vegetation management actions would have no impact on agriculture. Sale or exchange of 4,480 acres could include some or all of the 637 acres of public land currently utilized as cropland and tame pasture. However, there are only 33 acres in the short term and 128 acres in the long term that have a potential to be plowed and are in land capability Classes III and IV.

There would be no impacts from wilderness actions, because there is no agricultural use in the WSAs.

Summary

The cumulative impact on regional agriculture would be insignificant. Coal mining actions could have a significant impact on some individual operators. Land actions could have a beneficial impact on some individual operators. There would be no impacts from vegetation management or wilderness actions.

Economics

The projected capacity of existing mines, mines cleared by previous planning, private mines and mines resulting from the 1984 sale have been incorporated into the baseline used for estimating projected impacts. See Table 3-3.

The Mud Springs tract has been considered as a mine mouth conversion power plant site, which would require workers for the four-year construction phase (1988-1992). The coal mine would start producing in 1991 and would be at full production in 1992. All other mines are assumed to be in production by 1990, which would be the year of greatest impact (worst case). Coal production should stabilize and projections shown for 1995 prevail until 2033 and would be considered the long-term analysis.

Employment and fiscal projections were derived using the BLM Casper District Office input-output model. Peak employment would result in 1990 and would result in an additional 8,550 jobs for all sectors in Big Horn, Powder River, and Rosebud Counties. See Table 4-6. Employment at the power plant at Mud Springs would start to decline in 1991. Workers would start to develop the mine needed to support a power plant at that time. By 1993, employment of permanent miners would be completed and the construction force would diminish, resulting in a total of 5,750 workers in all sectors for the three-county region. This level of employment would remain through 2033.

Montana workers residing in Sheridan County, Wyoming have been proportioned on a percentage of employed as computed from actual figures from 1982. (See Table 4-7.)

Salaries and wages in the three-county region of Montana, are projected to increase by $168.5 million in 1990. This projection decreases to $134.5 million by 1995, due to the outflow of construction workers from a Mud Springs power plant project. This additional income would make a large contribution to increasing per capita earnings in the three-county region and may increase per capita earnings of nearby Indian tribes.

Projected population increases would not be limited to the county of employment. Projections have been assigned to the population in approximately the same ratio as existed in 1980. Table 4-8 identifies the projected population impact to Big Horn, Rosebud and Powder River Counties. The Sheridan County, Wyoming, population increase induced by mining in Montana is shown in Table 4-9.

TABLE 4-6
PROJECTED COVERED EMPLOYMENT AND SALARIES AND WAGES

(Salaries and Wages in Millions of Dollars)

ALTERNATIVE A (BASELINE)

County/Sector	1990		1995	
	Employment	Salaries and Wages	Employment	Salaries and Wages
Big Horn County				
Coal employment[1]	2,630	74.0	2,630	74.0
Construction employment[2]	600	17.7	600	17.7
All other employment[2]	2,790	30.2	2,790	30.2
All covered employment	6,000	121.9	6,000	121.9
Powder River County				
Coal employment[1]	1,090	23.9	1,390	30.0
Construction employment[2,3]	3,200	47.2	80	1.2
All other employment[2]	630	6.9	630	6.9
All covered employment	4,900	77.6	2,100	38.1
Rosebud County				
Coal employment[1]	1,540	43.2	1,540	43.2
Construction employment[2,3]	1,050	22.2	1,050	22.2
All other employment[2]	3,100	31.0	3,100	31.0
All covered employment	5,600	96.4	5,600	96.4

NOTE: Totals may not agree due to rounding.

[1] Projections of coal employment are based on the relationship of one additional employee for each additional 25,300 tons of projected coal capacity (relationship derived from the Casper District input-output model). Salaries and wages for coal are based on the 1980 weekly average wage for mining.

[2] Projected secondary employment is estimated at one additional job in the region for each additional permanent job in energy and 0.5 additional job in the region for each temporary job (as derived from the Casper District input-output model). The secondary employment is then distributed among sectors on the basis of each sector's share of the ten-year (1970-1980) regional change in all employment less mining. The secondary sector change is then distributed to the counties on the basis of each county's share of the ten-year (1970-1980) change in regional employment in that sector. Salaries and wages are projected on the basis of 1980 average weekly wage.

[3] Construction projections include construction employment for mines, power plants, and railroads, as applicable, in addition to secondary construction employment. Construction estimates for major projects were obtained from industrial planning and environmental impact statements.

Based on the length of this table, it was not reproduced for each alternative. Please refer back to this baseline information during additional discussions throughout this chapter.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 4-8
PROJECTED POPULATION TRENDS AND TOTAL HOUSING NEEDS
(Totals may not agree due to rounding)

ALTERNATIVE A (BASELINE)

	1990		1995[6]	
	Population	Housing	Population	Housing
Big Horn County[1]	17,900	6,200	17,900	6,200
Crow Reservation Div.[2]	9,100	2,800	9,100	2,800
Hardin Division[2]	6,900	2,820	6,900	2,820
Hardin[2]	5,300	2,180	5,300	2,180
Northern Cheyenne Div.[2]	1,630	460	1,630	460
Tongue River Division[2]	310	180	310	180
Powder River County[3]	8,200	3,650	5,100	2,275
Broadus Division[2]	4,300	1,990	2,665	1,240
Broadus[2]	2,340	1,100	1,449	680
East Powder River Div.[2]	2,380	990	1,475	640
Otter Division[2]	1,550	680	960	420
Rosebud County[4]	18,000	6,900	18,000	6,900
Ashland Division[5]	1,960	860	1,960	860
Ashland[5]	1,700	520	1,700	520
Forsyth Division[2]	6,000	2,510	6,000	2,510
Forsyth[2]	4,300	1,770	4,300	1,770
Northern Cheyenne Div.[2]	4,600	1,320	4,600	1,320
Rosebud Division[2]	5,400	2,230	5,400	2,230
Colstrip[2]	2,530	810	2,530	810

NOTE: Housing needs based on 1980 ratio of persons per house.

[1] Trends were derived by applying 1980 population-to-employment ratios to projected employment. A ratio of 2:992 was used for permanent employment, plus 1:256 for temporary employment.

[2] Trends are based on the 1980 share of county population.

[3] Trends were derived by applying 1980 population-to-employment ratios to projected employment. A ratio of 4:367 was used for permanent employment, plus 1:263 for temporary employment. As there was no apparent temporary population in Powder River County in 1980, the average of the temporary ratios for Rosebud and Big Horn Counties was used for Powder River County.

[4] Trends were derived by applying 1980 population-to-employment ratios to projected employment. A ratio of 2:997 was used for permanent employment, plus 1.270 for temporary employment.

[5] Not to be confused with the Ashland District of the Northern Cheyenne Reservation.

[6] 1995 projections were calculated using ratios from Casper District office input-output model by MCDO.

Based on the length of this table, it was not reproduced for each alternative. Please refer back to this baseline information during additional discussions throughout this chapter.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 4-7

PROJECTED COVERED EMPLOYMENT AND SALARIES AND WAGES FOR SHERIDAN COUNTY

(Salaries and Wages in Millions of Dollars)

ALTERNATIVE A (BASELINE)

County/Sector	1990 Employment	1990 Salaries and Wages	1995 Employment	1995 Salaries and Wages
Secondary employment induced in Sheridan County by Montana employment[1]	700	9.1	365	4.7
Montana workers residing in Sheridan County[2]	2,940	61.2	1,530	3.8

NOTE: Employment projections are derived from the Casper District input-output model. Salary and wage projections are based on 1980 average weekly wages as published by the Wyoming Employment Security Commission. Totals may not agree due to rounding.

[1] Estimate of employment induced in Sheridan County by primary employment in neighboring Montana counties. Because covered employment is reported by county of employment, these numbers are included in Sheridan County employment.

[2] Industrial estimates of the number of Big Horn County coal mine employees living in Sheridan County in 1982 were 50.89% of the estimated 1982 coal employment in Big Horn County. That percentage was used to estimate the number of persons employed in Big Horn County and at the Mud Springs tract in Powder River County who might reside in Sheridan. Because covered employment is reported by county of employment, these numbers are included in Big Horn County and Powder River County employment.

Based on the length of this table, it was not reproduced for each alternative. Please refer back to this baseline information during additional discussions throughout this chapter.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

Sheridan County, Wyoming, would not receive taxes or impact assistance from the State of Montana due to this increased mining activity.

Population increases to this sparsely populated region would also affect the population of the Indian reservations. Due to increased employment opportunities, many Indians would return to the reservation. In addition, non-Indians can be expected to reside on the reservation. These projections are shown in Table 4-10.

Community services requirements are projected in Tables 4-11 through 4-14 for the three counties and the Indian reservations for the short term and long term. Increased school enrollment would be the greatest impact from the increased population.

Communities would require additional water capacity, law enforcement officers and firefighters. Powder River County and the Northern Cheyenne Indian Reservation do not have hospitals, but with the increased population, an increasing need is identified.

Table 4-15 presents a comparison of potential revenues to estimated peak expenditures for the three counties. Estimates of revenues for counties and schools where coal is mined are based on the gross proceeds tax and property taxes. The taxable value of gross proceeds is 45% of the contract value of coal (estimated at $7.83 per ton of coal production using 1980 data—Powder River II Coal EIS). The taxable value of coal property is 11% of the market value of the property (estimated at $5 million per million tons of production capacity).

The Mud Springs power plant would be an additional source of property tax revenue for Powder River County and Powder River County schools. The taxable value of power plant property is 15% of the market value, which is estimated at $200,000 per megawatt of production capacity for this analysis.

TABLE 4-9
PROJECTED POPULATION TRENDS AND TOTAL HOUSING NEEDS FOR SHERIDAN COUNTY
ALTERNATIVE A (BASELINE)

	1990		1995[4]	
	Population[1]	Housing[2]	Population[1]	Housing[2]
Primary impact of Montana employment	5,800	2,530	3,020	1,315
Secondary impact of Montana impacts	1,950	850	1,015	440
Base without Montana Impacts[3]	32,500	14,200	32,500	14,200
County total	40,300	17,600	36,535	15,940
City of Sheridan	24,300	10,600	22,100	9,640

NOTE: Totals may not agree due to rounding.

[1] Projections of total Sheridan County population are based on the 1980 population-to-employment ratio of 2:8997 for permanent employment, plus 1:2085 for temporary employment. Estimates of primary and secondary impacts to Sheridan County due to Montana employment were made after the population-to-employment ratio was modified by alternately adding and subtracting Montana employment and its effects from Sheridan County employment and population in each projected year. City population is projected at its 1980 share (60.47%) of county population.

[2] Housing projections are based on 1980 ratio of 2:292 persons per house for the county and 2:293 persons per house for the city.

[3] Base population and housing were derived by subtracting primary and secondary impacts from the total.

[4] 1995 projections were calculated using ratios from Casper District Input-Output Model.

Based on the length of this table, it was not reproduced for each alternative. Please refer back to this baseline information during additional discussions throughout this chapter.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 4-10
PROJECTED POPULATION WITH TOTAL HOUSING REQUIREMENTS FOR THE CROW AND NORTHERN CHEYENNE INDIAN RESERVATIONS

ALTERNATIVE A (BASELINE)

	1990		1995	
	Population	Housing	Population	Housing
Crow Reservation				
Indian	5,400	1,090	5,400	1,090
Non-Indian[1,2]	4,000	2,050	4,000	2,050
Reservation total[1,2,3]	9,400	3,140	9,400	3,140
Lodge Grass[5]	1,210	340	1,210	340
Northern Cheyenne Reservation				
Indian	4,500	1,040	4,500	1,040
Non-Indian[1,2]	1,680	980	1,680	980
Reservation total[1,4]	6,200	2,020	6,200	2,020
Ashland (on reservation)[5]	630	210	630	210
Birney (on reservation)[5]	240	10	240	10
Busby[5]	1,360	440	1,360	440
Lame Deer[5]	3,360	1,100	3,360	1,100

NOTE: Totals may not agree due to rounding.

[1] Population increases were derived by applying the reservation's share of county population in 1980 to the projected change in county population.

[2] Housing projections are based on the number of persons per house in 1980.

[3] Includes the portion of the Crow Reservation in Yellowstone County, Montana. This portion was held constant for the projection.

[4] Reservation housing is the sum of Indian and non-Indian housing.

[5] Community population projections are based on the community's share of reservation population in 1980. Community housing is based on the community's share of reservation housing in 1980.

Based on the length of this table, it was not reproduced for each alternative. Please refer back to this baseline information during additional discussions throughout this chapter.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, Jan. 1984

TABLE 4-11
PROJECTED 1990 REQUIREMENTS FOR COMMUNITY SERVICES (SHORT TERM)
(based on 1979-1980 levels per 1,000 population)

ALTERNATIVE A (BASELINE)

County/ Community	School Enrollment	Water Capacity (million gallons/ day)	Sewage Capacity (million gallons/ day)	Law Enforcement (sworn officers)	Firefighters		Hospital Beds
					Fulltime	Volunteers	
Big Horn	3,900	—	—	26	—	37	81
Hardin	—	6.4	(1)	(2)	—	32	—
Powder River	1,890	—	—	13	—	49	20[3]
Broadus	—	1.6	(4)	(1)	—	(5)	—
Rosebud	4,600	—	—	35	—	—	47
Ashland	—	(6)	(6)	(2)	—	4[7]	—
Colstrip	—	(8)	(8)	(2)	—	46	—
Forsyth	—	5.9	.8	(2)	—	27	—

[1] Hardin has sewage treatment capacity to serve a population of 6,000.

[2] It is assumed that the county can continue to provide adequate law enforcement service.

[3] Based on regional average of four beds per 1,000 population.

[4] On the basis of usage in 1979-1980, it is assumed that the present three-cell, 7.72-acre lagoon would be utilized at less than 2/3 of capacity.

[5] It is assumed that the county can continue to provide adequate volunteer firefighting service.

[6] Ashland has water and sewage capacity to service a population of 2,500.

[7] Based on regional community average of six volunteers per 1,000 population.

[8] Colstrip has water capacity to serve a population of 7,200 and sewage capacity to serve 7,500.

Based on the length of this table, it was not reproduced for each alternative. Please refer back to this baseline information during additional discussions throughout this chapter.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 4-12
PROJECTED 1990 REQUIREMENTS FOR COMMUNITY SERVICES (SHORT TERM) FOR THE CROW AND NORTHERN CHEYENNE INDIAN RESERVATIONS

ALTERNATIVE A (BASELINE)

County/ Community	School Enrollment	Water Capacity (million gallons/day)	Sewage Capacity (million gallons/day)	Law Enforcement (sworn officers)	Firefighters		Hospital Beds
					Fulltime	Volunteers	
Crow Reservation	(1)	—	—	21	8[2]	—	—
Crow Agency	(1)	1,200	23	16	—	14	47
Lodge Grass	(1)	380	16	3	—	14	—
Northern Cheyenne Reservation	(1)	—	—	22	9	—	21[3]
Ashland (on reservation)	600	100	6	1[4]	—	3[5]	—
Birney (on reservation)	(1)	100	3	0[4]	—	1[5]	—
Busby	320	210	4	2[4]	—	7[5]	—
Lame Deer	(1)	520	14	4[4]	—	17[5]	—

NOTE: Based on 1979-1980 levels per 1,000 population where existing; otherwise based on standards footnoted.

[1] Public schools are operated by the county. Enrollment levels for Big Horn and Rosebud Counties are presented in Table 4-14.

[2] Part-time firefighters employed by the Bureau of Indian Affairs, U.S. Department of the Interior.

[3] Based on a regional average of four beds per 1,000 population.

[4] Based on a regional average of 1.4 officers per 1,000 population.

[5] Based on a regional average of six volunteers per 1,000 population.

Based on the length of this table, it was not reproduced for each alternative. Please refer back to this baseline information during additional discussions throughout this chapter.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 4-13
PROJECTED 1995 REQUIREMENTS FOR COMMUNITY SERVICES (LONG TERM) FOR THE CROW AND NORTHERN CHEYENNE INDIAN RESERVATIONS
ALTERNATIVE A (BASELINE)

County/ Community	School Enrollment	Water Capacity (million gallons/day)	Sewage Capacity (million gallons/day)	Law Enforcement (swom officers)	Firefighters		Hospital Beds
					Fulltime	Volunteers	
Crow Reservation	(1)	—	—	21	8[2]	—	—
Crow Agency	(1)	1,300	24	17	—	14	47
Lodge Grass	(1)	380	17	3	—	14	—
Northern Cheyenne Reservation	(1)	—	—	22	9	—	—
Ashland (on reservation)	620	110	6	1[4]	—	3[5]	22[3]
Birney (on reservation)	(1)	100	3	0[4]	—	1[5]	—
Busby	320	210	4	2[4]	—	7[5]	—
Lame Deer	(1)	530	15	4[4]	—	18[5]	—

[1] Public schools are operated by the county. Enrollment levels for Big Horn and Rosebud Counties are presented in Table 4-14.

[2] Part-time firefighters employed by the Bureau of Indian Affairs, U.S. Department of the Interior.

[3] Based on a regional average of four beds per 1,000 population

[4] Based on a regional average of 1.4 officers per 1,000 population.

[5] Based on a regional average of six volunteers per 1,000 population.

Based on the length of this table, it was not reproduced for each alternative. Please refer back to this baseline information during additional discussions throughout this chapter.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, Jan. 1984

TABLE 4-14
PROJECTED 1995 REQUIREMENTS FOR COMMUNITY SERVICES (LONG TERM)
(based on 1979-1980 levels per 1,000 population)

ALTERNATIVE A (BASELINE)

County/ Community	School Enrollment	Water Capacity (million gallons/day)	Sewage Capacity (million gallons/day)	Law Enforcement (sworn officers)	Firefighters		Hospital Beds
					Fulltime	Volunteers	
Big Horn	3,900	—	—	26	—	37	81
Hardin	—	6.4	(1)	(2)	—	32	—
Powder River	1,175	—	—	10	—	31	20[3]
Broadus	—	1.0	(4)	(2)	—	(5)	—
Rosebud	460	—	—	35	—	—	47
Ashland	—	(6)	(6)	(2)	—	4[7]	—
Colstrip	—	(8)	(8)	(2)	—	46	—
Forsyth	—	5.9	0.8	(2)	—	27	—

[1] Hardin has sewage treatment capacity to serve a population of 6,000.

[2] It is assumed that the county can continue to provide adequate law enforcement services.

[3] Based on regional average of four beds per 1,000 population.

[4] On the basis of usage in 1979-1980, it is assumed that the present three-cell, 7.72-acre lagoon would be utilized at less than 2/3 of capacity.

[5] It is assumed that the county can continue to provide adequate volunteer firefighting services.

[6] Ashland has water and sewage capacity to serve a population of 2,500.

[7] Based on regional community average of six volunteers per 1,000 population.

[8] Colstrip has water capacity to serve a population of 7,200 and sewage capacity to serve 7,500.

Based on the length of this table, it was not reproduced for each alternative. Please refer back to this baseline information during additional discussions throughout this chapter.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 4-15

PROJECTED REVENUES COMPARED TO PROJECTED PEAK EXPENDITURES FOR THE RESOURCE AREA COUNTIES AND COMMUNITIES

(in thousands of dollars, rounded to the nearest $100,000)

ALTERNATIVE A (BASELINE)

	1990	1995
Big Horn County		
Revenues	10,200	10,200
Expenditures	9,900	9,900
Big Horn County Schools		
Revenues	17,100	17,100
Expenditures	16,000	16,000
Hardin		
Revenues	1,100	1,100
Expenditures	1,200	1,200
Powder River County		
Revenues	11,900	14,100
Expenditures	12,600	7,800
Powder River County Schools		
Revenues	13,400	18,000
Expenditures	6,600	4,068
Broadus		
Revenues	300	200
Expenditures	400	300
Rosebud County		
Revenues	10,200	10,200
Expenditures	11,600	11,600
Rosebud County Schools		
Revenues	10,300	10,300
Expenditures	10,700	10,700
Ashland		
Revenues	210	210
Expenditures	580	580
Colstrip		
Revenues	7,000	7,000
Expenditures	8,300	8,300
Forsyth		
Revenues	2,300	2,300
Expenditures	2,300	2,300

NOTE: Debt servicing is included.

Based on the length of this table, it was not reproduced for each alternative. Please refer back to this baseline information during additional discussions throughout this chapter.

The county levy for Big Horn County in 1980 was 38.28 mills; the mill levy for Rosebud County schools in 1980 was 78.45. For purposes of this analysis, these levies were used for all counties and schools in the three-county region.

Communities in the three counties would not benefit from gross proceeds or property tax revenues from the mines; instead, they would find it nececessary to petition the Montana Coal Board for revenues, increase user fees, raise taxes, sell bonds or establish special improvement districts.

The Crow and Northern Cheyenne Indian Reservations

Table 4-16 presents a comparison of potential revenues and expenditures on the reservations. Like the communities in the region, the reservations would experience secondary population changes, but they would not participate in increased revenues from gross proceeds or property taxes.

These figures have been projected from actual expenditures per capita in 1980. To provide the same amount of services provided in 1980 would require additional revenues to those presently derived to provide these services in 1990 due to a population increase. The reservations do not have property taxes, gross proceeds, state funds, or county funds to provide revenues. Reservations can petition the Montana Coal Board for additional funds or grants. Also, requests through the BIA to Congress for additional funds may be necessary. If funds are not available, a reduction in services may be required.

If all coal is mined over a 40-year period, a total of 131,091 acres would be disturbed. Of this total, approximately 8,938 acres of cropland would be disturbed. This would equal approximately 223.5 acres disturbed per year. These lands would produce 6,391 bushels of wheat or 333 tons of hay. At 1982 prices provided by the Montana Department of Agriculture, this would be an annual loss of $25,561 from wheat or $17,697 from hay. Again this loss from economic activity would be greatly surpassed by inputs from mining. The rancher or ranchers would be compensated for this annual loss.

After reclamation, these lands would be returned to agricultural use at the same levels or greater than before mining.

Of this total, 122,191 acres would be private, state and federal rangeland and would support one AUM per five acres. These lands could support a total of 24,438 AUMs. This would equal a loss of 610 AUMs per year due to mining. This is approximately 50 AUs at a value of $400 per head that would amount to $20,000 loss from rangeland per year. This loss is very small when compared against the economic activity that mining would bring into the area.

TABLE 4-16
PROJECTED REVENUES COMPARED TO PROJECTED PEAK EXPENDITURES ON THE CROW AND NORTHERN CHEYENNE INDIAN RESERVATIONS

(in thousands of dollars, rounded to the nearest $100,000)

ALTERNATIVE A (BASELINE)

	1990	1995
Crow Reservation		
Revenues (1990)[1]	8,900	8,900
Expenditures (1990)[2]	10,200	10,200
Lodge Grass		
Revenues (1990)[1]	120	120
Expenditures (1990)[2]	140	140
Northern Cheyenne Reservation		
Revenues (1990)[1]	6,100	6,100
Expenditures (1990)[2]	7,200	7,200

[1] Revenues are not expected to increase, as the reservations are not expected to benefit from gross proceeds or property taxes.

[2] Expenditures are projected on the basis of 1980 per capita expenditure levels.

Based on the length of this table, it was not reproduced for each alternative. Please refer back to this baseline information during additional discussions throughout this chapter.

The ranch owners who have surface lands that would be removed from use during mining would be compensated for this loss by the mining companies.

This alternative would not affect the present assignment of AUMs for grazing and consequently there would be no change to the economics of the area. Average cost of improvement would be $4.83 per AUM.

Exchanges, sales, and recreation and public purposes transactions enable the BLM to eliminate isolated tracts. Where a public need is demonstrated, the transfer of use of public lands to other agencies makes the public lands more economical to manage. Local governments receive very little if any economic impact due to these transactions in the short and long term.

There would be no economic impact from recommending Zook Creek or Buffalo Creek WSAs as nonsuitable for wilderness

Social Impacts

This alternative could cause minimal additional significant social impacts, depending on the number and location of lease tracts actually developed for coal. Very little additional social impact or community disruption would occur if the Colstrip and Decker areas were leased, because they would basically be maintenance tracts. There would be few social impacts occurring if the Greenleaf-Miller unleased area were developed, assuming that the workers would reside in Colstrip. There could be secondary impacts to existing roads and to ranchers from increased traffic and development. There could be some direct social impacts from development of the Greenleaf-Miller area if members of the Northern Cheyenne tribe would lease their reservation land for energy worker housing. The likelihood of this happening is unknown at this time.

The Colstrip community has already experienced a loss of small town community interaction where everybody knows each other. A rapid influx of new people has shattered informal means of social integration. Old organizations have become more bureaucratized, while new organizations have formed to meet the needs of a larger, more diverse community. Rosebud County, where Colstrip is located, has a county planning office and zoning ordinances to help control growth. Rosebud County has also received funds from the Montana Coal Board and has existing linkages to accommodate further growth.

The Sheridan community in Wyoming, where most of the Decker miners reside, has also experienced social disruption due to mining growth and is now generally well prepared to deal with additional population and economic growth. In Sheridan, city planning mechanisms are in place for higher levels of residential growth.

If existing roads were paved and improved, one could assume that most mining workers from the Mud Springs and Hanging Woman tracts would reside in Sheridan, causing some additional impacts.

However, possible leasing and development of the Otter Creek, Ashland (Decker-Birney), and Ashland (Coalwood) tracts have the potential of creating significant social impacts. These tracts, if developed, would greatly impact the Ashland, Broadus, Kirby, Birney and Otter Creek communities. The Kirby, Birney and Otter Creek communities are very small rural agricultural communities that presently contain very little social infrastructure in place. If coal leasing and development occurred nearby, there would likely be serious shortfalls in services and housing and possibly new communities would develop within or near these existing rural, agriculturally-based communities.

Currently, relationships are face-to-face and informal. Social status is based more on personal characteristics, length of residence, extent of long-term family ties, and size of land holdings, rather than based mainly on economic position. Coal development would alter existing social relationships and in the long run would lower the status of certain groups while raising the status of others. Social relations would become more formalized, due to increased population and social diversity. General social impacts from increasing coal mining activity may be the loss of some community social integration, shifts in power structure away from the traditional rancher dominance, and status inconsistency problems with working class interests having high income. In the short term, newcomers may not be readily accepted, especially in the traditional ranching communities. Separate social networks may exist with miners socializing with miners and ranchers socializing with ranchers. In the long term, cumulative mine development would diversify the lifestyles, values, interests and attitudes in these communities. There would also be better employment opportunities for local people and probably improved shopping and other facilities. Some loss of cultural identity and lifestyle may be experienced by both white ranchers and Native Americans.

The Montana Department of State Lands conducted a telephone survey of 85 Ashland-Birney-Otter Creek residents in 1981. The respondents were rather evenly divided in their opinions on having one coal mine open in their area. But 62.4% were opposed to having four or five mines within 20 miles of Ashland. The majority of the respondents said that the new population influx would be the main disadvantage for the local residents, if a mine were developed. The main advantage to local mine development would be employment and economic opportunities.

Since the 1960's, Powder River County residents have benefited from oil and gas development at Belle Creek. The Belle Creek field has generated revenues to

Powder River County that have helped to keep taxes low and yet provide new facilities (nursing home, high school, county courthouse, clinic). Belle Creek production will continue to decline through 1990. There is an awareness among county residents that unless new oil fields are discovered or coal mines are developed, local taxes will increase. There is some rural opposition to coal development, but that is confined mostly to the western area of the county. In Broadus, there is some indication that private commercial interests may be eager to capitalize on possible growth from coal development.

With coal development, there is a potential for per capita income to increase with a corresponding increased demand for facilities and services. Currently, there are serious shortages of quality medical care in certain portions of the Resource Area due to a lack of hospital beds and physicians. This problem would be seriously exacerbated with a large population influx. In the face of large-scale coal development, the current housing supply in Powder River County, Broadus, and Ashland would be seriously inadequate. Also, there would probably be increased community service needs in law enforcement and mental health service agencies.

Neither Powder River County nor Broadus have land use planning controls to guide rapid growth. Ashland is an unincorporated community and does not have much in the way of formal government to respond to growth demands. Rosebud County does have a planning office that could provide some services to Ashland.

Depending on the number and location of mines developed, there is a potential for the Northern Cheyenne Indian reservation to experience social impacts. One of the more likely impacts may be increased non-Indian traffic on the reservation. Trucks and equipment may cause increased wear on the existing U.S. Highway 212 through the reservation and also on the Busby-Kirby road to Decker. This would cause increased safety problems, poaching and increased law enforcement and jurisdictional disputes. Law enforcement for minor violations and crimes by non-Indians would be hard to enforce, because Tribal police do not have complete jurisdiction over non-Indians. Tribal police can and do request assistance from the State Patrol and the County Sheriff. Major crimes would be handled by Federal marshals, the FBI, etc. There is a possibility that increased non-Indian traffic on the reservation may cause increased clashes between cultures.

Historically, there has been little non-Indian in-migration onto the reservation during periods of coal development on nearby areas. This trend is expected to continue. The social norms are such as to discourage Indians from leasing or selling their land to non-Indians. But at present, an Indian who holds lands in trust can legally lease his/her land to non-Indians for housing and commercial developments. Currently, there is no clear Tribal policy on how much in-migration of non-Indians would be allowed before it would be restricted. Perhaps a more likely scenario, if additional mines were developed around the reservation, might be for off-reservation Northern Cheyenne to return to the reservation to work at the mines. This would have the potential of adding strains to service delivery and in providing housing. No comprehensive plan has been developed to accommodate an influx of people on the reservation (personal communication, Ed Dahle and Steve Chestnut, June 1983). There is no infrastructure on the reservation prepared to review water and sewer plans for possible environmental and health impacts.

The Northern Cheyenne have a number of concerns over coal mine development. The Northern Cheyenne Planning Office did a household survey in the Ashland and Birney Districts in 1981. There is a concern that the tribal culture is disintegrating due to cross-cultural contact. Concern was expressed in the survey that further cultural disintegration may occur as a result of coal development in the area. A further concern of the Northern Cheyenne is that coal mine development nearby would increase demand for community services that are strained now. The Northern Cheyenne tribe has expressed concerns about impacts on water, scenic values and air quality from increased coal mining. Of the reservation communities, Ashland, Birney Day School and Lame Deer would probably experience the heavest impacts from off-reservation development.

The Crow tribe has also expressed concerns that nearby coal development could cause added law enforcement problems and jurisdictional disputes. They also had concerns that increased traffic on Highway 212, which runs through their reservation, could impact road and safety conditions. Because they are in the process of trying to develop their own reservation coal, they have indicated some concern that nearby federal coal development might compete with their coal in a tight coal market.

However, if additional coal mines were developed near either the Northern Cheyenne or Crow reservations, important employment opportunities could develop for the Native Americans. The demographic profile of both tribes is such that in another ten years, they will both have a potentially large labor force. Both tribes have high birth rates and a large proportion of their population currently under age 14. The development of new mines could help solve an important social problem of both tribes' unemployment. Both tribes have expressed interest in instituting tribal preference in hiring at future local mines.

There would be no social impacts occurring from maintaining existing range management.

The existing land program has resulted in social benefits to individual landowners, recreationists and local communities. Small isolated parcels have been sold to operators who have viewed the land as their own for years and will now have greater control over that land. Land exchanges and sales have increased access to public land best suited for recreation. This has improved recreation opportunities for residents in the Resource Area. Communities that have had their boundaries and uses hemmed in by federal land have been able to expand through recreation and public purposes leases and patents. This has enabled community development and improvement.

There would be minimal social impacts resulting from wilderness actions.

Coal

A maximum of 65.18 billion tons of coal with developoment potential plus any additional coal mined as a result of emergency leases, would be irretrievably and irreversibly lost by mining. It is anticipated that the demand for coal in the future will be much less than the total available. Most areas cleared in planning would not be delineated into tracts for possible leasing. Also, it is highly unlikely that all coal with development potential would be mined, because currently, coal companies rarely extract coal under more than 200 feet of overburden, whereas coal with development potential has up to 500 feet of overburden.

Exchange of coal for coal in alluvial valley floors and through legislative dictums could remove a significant amount of coal from development potential status. These exchanges are mandated by regulations and are not discretionary. In addition, this alternative would allow coal exchange on a case-by-case basis. Although exchanges would be limited to equal value, in the short term, significant impacts could occur to federal coal royalties. This would result if checkerboard federal coal areas were acquired and mined by a private entity controlling adjacent sections, at a time when the coal market was too limited to absorb leasing of an additional tract of completely federal coal delineated as a result of the exchange. In the long term, the federal coal would be mined and royalty impacts would be insignificant. Exchanges may also compensate the federal government by providing resources other than coal to the public domain.

There would be no impacts on the coal resource from vegetation utilization actions.

Impacts could occur to the availability of the coal resource if sale or exchange of the surface permitted the new surface owner to deny consent to mine underlying federal coal. However, since areas of currently defined coal with development potential have all been placed in the "retention" category, the acreage involved would be small and impacts would be insignificant. It is possible that some of the 164,723 surface acres proposed for sale or exchange could occur if areas with unknown coal potential were disposed of. Coal ownership would be retained if the lack of coal were not demonstrated in the site specific mineral report required for each disposal action. However, disposal of the surface could affect surface owner consent in the long term.

In the short and long term, the coal resource in Zook Creek WSA would not be suitable for coal lease consideration, resulting in the irreversible and irretrievable commitment of the resource to preservation. This impact would involve 8,438 acres of coal land, containing 464 million tons of coal with development potential. This coal is 0.6 percent of the total federal coal with development potential and is distant from areas of current or proposed mining, so the impact to coal development would be insignificant.

Because Buffalo Creek WSA would be recommended as nonsuitable for wilderness designation, coal with development potential within this WSA would become available for further consideration pending full application of the unsuitability and multiple use screens.

Summary

There would be significant impacts from the coal actions, no impacts from vegetation utilization actions, no known significant impacts from land actions and insignificant impacts from wilderness actions.

Other Minerals

Three oil and gas fields, Liscom Creek, Pumpkin Creek, and Leary extend into the acceptable coal area. The area of long-term impact covers about 2,400 acres. An additional 5,600 acres were deleted from coal leasing consideration due to multiple use conflicts. Short-term impacts are expected to be insignificant, since the affected areas lie outside current areas of coal industry interest. Long term impacts are unknown. The only other known mineral resources of note in the coal area are clinker and sand and gravel. Because they are very abundant, conflicts with coal actions are expected to be insignificant.

There would be no impacts on other minerals from vegetation utilization actions.

Disposal of the surface estate over reserved oil and gas minerals would have the impacts of: (1) reducing the BLM workload of checking reclamation from seismic exploration, and (2) complicating the permitting process for the lessee, since an additional participant (the surface owner) besides BLM would be involved. These impacts would not be significant.

There would be no impacts on claimed locatable minerals, since lands with mining claims recorded under Section 314 of FLPMA are prevented from being exchanged or sold. Disposal of the surface estate would prevent unclaimed locatable minerals from being claimed and recorded, pending regulations issued by the Secretary of the Interior. The resulting short- and long-term impacts would not affect BLM, since the federal government receives no royalties from locatable minerals, but impacts would occur to private mining parties who lose access to potential mineral resources. Some of the 164,723 surface acres proposed for disposal would be significantly affected, especially in the Alzada area.

Disposal of the surface estate would not affect BLM ownership of underlying mineral materials. A 1983 U.S. Supreme Court decision affirmed public ownership of sand and gravel on lands where the surface only was patented. Mineral entry rights would be preserved.

There are no mining claims at Zook Creek, so there would probably be no impact to the locatable minerals resource. However, claims could be located until any designation as wilderness. Thereafter, development could occur on valid claims. There are existing pre-FLPMA oil and gas leases on 5,831 acres which could be developed. There would be no impact to oil and gas development from these leases. The remaining 2,607 acres are under post-FLPMA leases, which permit development if wilderness values would not be impaired. Impacts to oil and gas development from these restrictions could be significant. Under 1983 policy, leases that expire will not be reissued. With these exceptions, the minerals resources are committed to preservation, which because of the size and potential of the WSA, is an insignificant impact.

There would be no impacts on the availability of Buffalo Creek WSA for oil, gas, or geothermal leasing, location of mining claims, or material sales, since the area would be recommended as nonsuitable for wilderness designation.

Summary

There would be insignificant impacts from coal actions, no impacts from vegetation utilization actions, significant impacts from lands actions in localized areas and no impacts from wilderness actions.

Range

If all the areas were mined, there would be an approximate loss of up to 198,700 AUMs during mining on public and private surface. The most serious effect on vegetation after reclamation would be the irretrievable and irreversible loss of the natural vegetative mosaic and species diversity on all 993,591 acres. However, vegetation production may be better after mining, due to extensive reclamation. Fifteen thousand acres identified as needing range improvements overlap with areas acceptable for further coal leasing consideration. When public surface is delineated within a tract for possible coal leasing, as well as within existing coal leases, no additional range improvements would be proposed.

Current vegetation utilization for livestock of 208,083 AUMs would continue in the short term (five years) and increase by 12% to 233,387 AUMs in the long term (15 years) through range improvements on the 160,024 acres of selected fair and poor condition rangeland. Range condition would be expected to improve by 15%. This increase in AUMs is based on soil productivity potential.

The overall effect of the proper application of mechanical treatments on 125,023 acres over the long term would be an improvement of range condition and a 100% increase in vegetation production.

Development of structural range improvements would reduce available forage by 1,819 AUMs during construction, but would increase the overall range condition on those acres that are selected for range improvements.

The 72 potential activity plans on 215,905 acres, when implemented, would provide an increase in plant vigor and species diversity. There would be a 15% increase in range condition and a 12% overall increase in AUMs.

The 12 functional AMPs would have no new impacts on vegetation production. As the 15 nonfunctional AMPs become more functional, there would be an increase in plant vigor and species diversity. There would be a 15% increase in range condition and a 12% overall increase in AUMs due to possible changing of grazing systems. However, because of the relatively small number of acres, totaling 24,426, there would be an insignificant increase in range condition.

The wildlife projects that would be constructed would have no impact on vegetation production.

Improved management, range improvement placement and use supervision would result in improvement of 5,000 acres of riparian areas to a healthy woody riparian condition, having all age classes of trees represented with 30% or more of the stand being sapling or younger. Reduced use of riparian zones as forage areas and shade sources for livestock would result in an increase in cover and plant community structure and health.

Control of 40 acres of prairie dog towns would have an immediate effect of improving vegetative production and range condition. Production would increase 100% because of improved plant vigor and the transition of the plant community from low to high producing species. Increased vegetation, shade and litter would increase site moisture retention and improve plant growth conditions.

Control of 130 acres of noxious weeds would result in up to a 200% increase in range condition through increases in desirable plant species, useful vegetation production and improved soil protection.

The short-term effect of prescribed burning on 20 acres and 500 acres burned from wildfires would be a loss of all forage being produced on the site. The long-term effect, depending on the range site, would be a 50 to 70% increase in livestock forage through recovery of more desirable plant species.

Vegetation Utilization—Livestock

Current short-term utilizations would not affect livestock. Long term increased utilization of 25,304 AUMs would provide feed for an additional 4,217 adult cattle for a six-month grazing season.

Livestock stress, due to moving livestock between pastures, would increase slightly on potential activity plans if implemented. Reliable spring livestock forage and cover for young calves would be provided in grazing systems. Livestock breeding success would be improved by fencing, which would create closer stock confinement. Changes in grazing management practices and allotments without activity plans would have little impact on stock.

As M and C allotments would generally not be improved, current use levels would not affect livestock. Livestock production would increase and grazing distribution would improve because of land treatments and range improvements. There would be no significant impact to livestock.

There would be a short-term loss of 4,716 AUMs and a long-term loss of 16,473 AUMs from land sales. The sale of these tracts would result in reduced grazing administrative costs.

There would be a short-term loss of 4,716 AUMs and a long-term loss of 16,473 AUMs from land exchanges. The loss of AUMs could be offset by similar or a greater amount of vegetation production in lands gained from exchanges. Exchanges which consolidate tracts of public land would result in more efficient grazing administration.

Land disposal through R & PP actions would have no significant impact on the range resource.

Because Zook Creek would be recommended as suitable for wilderness designation, there would be no impact on the range resource. There would be restrictions on using mechanical equipment for range management practices.

Because Buffalo Creek would be recommended as nonsuitable for wilderness designation, there would be no impact on the range resource in the short term. In the long term, 689 acres would be upgraded to good condition by range improvements. There would be an increase of 144 AUMs for livestock and 432 AUMs for wildlife and other nonconsumptive uses.

Summary

There would be significant cumulative impacts on vegetation from coal mining, range vegetation utilization and land sales actions. Impacts on vegetation from land exchanges and wilderness actions would be insignificant. Under this alternative 85% of the rangeland would be in good or better condition after improvement.

Hydrology

Coal—Surface Water

Impacts to surface water quantity from coal mining are expected to be insignificant during mining and reclamation. Streamflow downstream of the mine sites would be retarded and possibly reduced by sedimentation ponds on the mine sites. The overall effects would be to reduce flood peaks and slightly reduce streamflows. Surface runoff and associated peakflows would probably increase by approximately five percent, due to the decreased infiltration capacity of spoils immediately following reclamation (Arnold and Dollhopf 1977). Dollhopf (1979) predicts that the infiltration will improve as root systems develop and become similar to native rangeland. It is estimated to take 10 to 15 years to regain prior infiltration capacity. The net long-term effect of mining on surface water quantity would be insignificant.

Impacts to surface water quality are also generally expected to be insignificant during mining and reclamation. State regulations limit amounts of suspended solids, iron, manganese, and acidity in waters discharged from mined land. Monitoring is required to assure compliance. Impacts could be significant in isolated areas where groundwater from a mining area is the major contributor to the surface water drainage. In such areas, water would probably remain suitable for stock use, but not for agriculture. During mining, increased sediment loading from disturbed areas would be trapped by sedimentation ponds. After mining, sediment and water yields would be reduced by 574 ac ft/yr and 27,462 ac ft/yr, respectively, assuming reclamation and revegetation are successful (Table 4-17).

After reclamation, groundwater discharging from mined areas and carrying an increased salt load from leaching would add significantly to the salinity of nearby springs, seeps, and intermittent streams. The degree of increase depends on the geology of the area, but increases of 500 to 2,000 mg/1 TDS can be expected (MDSL and OSM 1983). Rahn (1976) found these increases typically were sulfates, calcium, magnesium and bicarbonates. Van Voast et al. (1978) speculates that most materials available for dissolution in the reclaimed spoils would be flushed with the first pore volume of water. However, in dry climates, such as found in eastern Montana, this process may take hundreds to thousands of years. In a practical sense, the impacts would be cumulative from all mined areas where salts were not flushed. Van Voast and Thompson (1982) have shown that no single mine can cause significant impacts to the Tongue River's quality or rate of flow. It is the cumulative effects from several mines which have the greatest chance of impacting a region's water resource. Estimates made by Van Voast for cumulative effects caused by nine active or proposed mines in the vicinity of Decker, Montana, show that post-mine groundwater reaching the Tongue River would increase its median dissolved solids content from 480 mg/1 to 510 mg/1.

A USGS modeling study (Woods 1981) predicts that Tongue River salinity would increase four to five percent following strip mining of 120,000 acres of federal land in southeastern Montana. This is less than one-tenth the increase caused by withdrawal and return flow of irrigation water. These results indicate that long-term regional effects from cumulative mines would not be significant in the Tongue River, but could be significant in smaller streams where groundwater from mined areas contributes a larger percentage of total surface water flow.

Coal—Groundwater

During mining, impacts to the local groundwater would be significant. Aquifers in the overburden and coal would be disrupted. Springs, seeps, and shallow wells in the immediate mine area would dry up or experience lowered water levels. Drawdown in wells caused by mining has been observed to extend from less than one-half mile to three miles (Hardaway and Kimball 1979; Van Voast et al 1978; Dollhopf et al 1978). The influence would vary with the direction of groundwater flow and would be typically greater in the downgradient direction (Van Voast et al 1977). After reclamation, impacts would be mitigated as the coal seam and overburden aquifers are replaced by a spoil aquifer. Depth and flow of groundwater in spoils would not differ greatly from conditions in undisturbed coal aquifers, but it may take several years for water levels to recover (Van Voast 1978).

According to Hardaway and Kimball (1978), a variety of professionals indicate that impacts are not significant on ground water quality during mining. A mine acts as a sink for groundwater and precludes any possible flow of contaminants into the groundwater system. Water intercepted during mining is pumped into holding ponds and discharged only in accordance with state regulations. Seepage from holding ponds has impacted downstream areas in isolated cases. Impacts can be mitigated by diligent pond construction methods.

TABLE 4-17
SUMMARY OF WATERSHED IMPACTS

ALTERNATIVE B

Impacting Element	Sediment Yield (ac ft/yr) Initial	Sediment Yield (ac ft/yr) Long Term	Water Yield (ac ft/yr) Initial	Water Yield (ac ft/yr) Long Term	Surface Water Quality Long Term	Groundwater Quality Long Term
Grazing Treatments	96	95	3,308	3,281	+	0
Mechanical Land Treatments	344	I	11,830	I	+	0
Fences	6	12	195	347	—	0
Water Developments (wells, springs, res.)	I	I	I	I	0	0
Fire	I	I	43	I	+	0
Chemical Treatments						
Noxious weeds	10	5	311	183	+	0
Prairie dogs	3	2	96	56	+	0
Riparian Areas	14	I	468	137	—	—
Coal Mining	1,717	1,143	86,723	59,261	—	—
Buffalo Creek WSA	8	5	388	265	—	—
TOTAL	2,199	1,263	103,362	63,530	—	—

I — insignificant
+ — increase
0 — no change
— — decrease

SOURCE: Omang, Parrett, and Hull 1983, BLM 1983 and Appendix I

In reclamation, overburden is used to refill the pits, thus exposing new surfaces to invading groundwater. These new surfaces contain significant quantities of leachable salts and minerals that readily dissolve. Thus, groundwater in mined areas shows increases in dissolved solids. The spread of pollutants from reclaimed areas is difficult to predict. Van Voast (1980) and Ahern and Frazier (1981) state the areal extent is modified by sorption, chemical precipitation, and dilution and may be limited to a few hundred yards from pit boundaries. Other studies (Rahn 1976 and Moran et al 1976) suggest this spread may extend several miles downgradient from pit boundaries.

Coal—Hydrology Summary

Present and anticipated levels of coal mining indicate that regional impacts to surface and groundwater resources from coal mining would be insignificant. However, in localized areas there would be significant impacts to groundwater quantity during mining and reclamation. These impacts would not be irreversible or irretrievable. Significant impacts to groundwater quality in localized areas would occur and would be both irretrievable and irreversible. In the worst case situation, regional groundwater quality degradation would occur and persist for hundreds to thousands of years.

Vegetation Utilization—Hydrology

Construction of range improvements such as fences would result in increased sediment and water yield of six ac ft/yr and 152 ac ft/yr, respectively. The increase would be caused largely by livestock trailing along new fences.

Development of reservoirs and pits would temporarily disturb soil. Nearby all soil disturbance would be upstream of dams and would not contribute sediment below the dams. Development of springs and wells would disturb an insignificant amount of soil and would not impact sediment or water yields.

Land mechanically treated would be exposed initially to wind and water erosion. However, infiltration would be improved, leading to increased soil moisture and vegetative cover (Wight and Sidoway 1972; Ryerson et al 1980; Saulman 1973; Neff and Wight 1977; Neff 1980). Sediment and water yields would be reduced by 344 ac ft/yr and 11,830 ac ft/yr, respectively. Mechanical treatment would not occur if holders of downstream water rights would be adversely affected.

Continued development and revisions of allotment management plans would slowly improve watershed condition. Sediment and water yields would consequently be reduced slightly in the long term by one ac ft/yr and 27 ac ft/yr, respectively.

Special management considerations for approximately 5,000 acres of riparian areas would result in less streambank erosion and improved water quality (Holechek 1980). Sediment and water yields would be reduced slightly in the long term by 13 ac ft/yr and 331 ac ft/yr, respectively.

Control of 40 acres of prairie dog towns and rehabilitation of the town sites would have an insignificant impact to water resources in the short term. In the long term, the cumulative impact would be to reduce sediment and water yields by one ac ft/yr and 40 ac ft/yr respectively, a very slight reduction.

High concentrations of noxious weeds force livestock to graze noninfested areas. Consequent reductions in vegetative cover would increase sediment and water yields (Noble et al 1979). Treatment of 130 acres of noxious weeds would result in reduction of sediment and water yields of five ac ft/yr and 128 ac ft/yr, respectively.

Acres burned by either prescribed burns or wildfires would expose bare ground to water erosion. Sediment and water yields would increase very slightly in the short term by one ac ft/yr and 43 ac ft/yr, respectively. Natural revegetation of burned areas in the long term would return sediment and water yields to pre-burn conditions.

Lands—Hydrology

No significant impacts to water resources would result from land sales or exchanges.

Wilderness—Hydrology

Zook Creek WSA would be recommended as suitable for wilderness designation. Designation would have little effect on current land uses due to the remoteness of the area. Insignificant impacts would be expected to water resources. Buffalo Creek WSA would be recommended as nonsuitable for wilderness designation and would be available for coal mining in the worst case scenario. If mined, sediment and water yields would be reduced by three ac ft/yr and 123 ac ft/yr respectively, assuming reclamation and revegetation techniques were successful (Table 4-17). No irretrievable or irreversible losses to surface water quantity or quality would be experienced in either the short or long term. Significant impacts to groundwater quantity would be experienced in the short term to water resources, but would not be irretrievable or irreversible. Significant losses to groundwater quality would be experienced in the long term following mining. These losses would be irretrievable and irreversible.

Summary

Cumulative sediment and water yields would be reduced by 936 ac ft/yr and 39,832 ac ft/yr respectively, a moderately significant reduction. Significant losses in groundwater quantity and quality would occur in localized areas near mine sites. Groundwater quality degradation could occur on a regional basis and persist for hundreds to thousands of years. Mechanical treatments would significantly reduce sediment and water yield. Other vegetative, lands, and wilderness actions would have no significant impacts on water resources.

Soils

Impacts to the soil during coal mining would involve significant increases in erosion and runoff on all 993,591 acres. Losses from wind and water erosion would be 43,457 acre feet of soil over the entire area disturbed. Reclamation potential is questionable on 120,000 acres that are in land capability Classes VII and VIII because of topography, depth to bedrock, rock outcrops and steepness of slope. Direct impacts to the soil from mining disturbances would alter the soil structure and porosity. This alteration would affect permeability, infiltration rates, soil-air and soil-water disruption of the nutrient cycle and a decrease in the organic matter content.

Proper replacement of subsoil and topsoil is critical for successful reclamation. Salt migration to the surface after profile reconstruction is possible, increasing the sodium content of the topsoil from its original level. This could decrease plant production and lower reclamation success. If layers of toxic soil material and restrictive layers are replaced lower in the profile than where they were originally found, plant production may be better after reclamation.

With proper mitigation, there would be no impacts to the soils resource after reclamation.

This alternative would improve 160,024 acres of watershed to good condition in the long term through better distribution of livestock and water sources, and implementation of land treatments. Management of livestock would redistribute grazing away from critical areas such as floodplains, riparian areas and around reservoirs, where possible. These areas are subject to trampling and compaction which reduce vegetation and increase runoff and erosion.

In addition, construction of 410 range improvements would distribute the livestock to utilize upland areas and allow watershed conditions to stabilize.

Approximately 125,023 acres in the "I" category have the potential to be mechanically treated, which would cause a loss of 175 acre feet of soil from wind erosion. Wind erosion would cause 22 acre feet of soil loss from the construction of 320 reservoirs, pits and pipelines and one acre foot of soil loss from livestock trampling along 100 miles of new fence lines.

Prairie dog control on 40 acres annually would increase vegetative cover 100% in the long term and reduce runoff and erosion.

Noxious weed control on 130 acres annually would initially kill vegetation, leaving dead plant residue that would help control wind and water erosion. In the long term, the treated areas would have a 200% increase in range condition through an increase of desirable plant species, minimizing erosion hazards.

Prescribed burning on 20 acres and 500 acres burned from wildfires would remove most vegetation, leaving only plant residue in the short term. This would increase the available plant nutrients in the soil, but also would cause accelerated erosion and the loss of organic matter. In the long term, there would be a 50 to 70 percent increase of vegetation over the current production level, which would minimize erosion hazards and offset the short term soil losses.

See Table 4-17 for sediment yields from water erosion by range improvements.

In the short term, there would be a loss of 197 acre feet of soil through wind erosion from project construction. In the long term there would be no significant losses of soil.

The sale of 82,362 acres would not impact the soils resource except where there may be a change in land use. The type of change made, i.e., agriculture and road or building construction, would determine the amount of erosion. This is expected to be an insignificant loss.

The exchange of 82,361 acres would not impact the soils resource if there is a change of use, since an equal value of lands would be received.

The disposal of lands through an R&PP action would have an insignificant impact on the soils resource if a land use change were to occur.

Minor positive long-term impacts to the soils resource at Zook Creek WSA would result because of the prohibition of general off-road vehicle use and the limitation of range improvements.

There would be no significant impacts to the soils resource in the Buffalo Creek WSA.

Short term impacts to the soil from coal mining in Buffalo Creek WSA would involve significant increases in erosion and runoff on 5,650 acres. Losses from wind and water erosion would be 247 acre feet of soil over the entire area disturbed. Reclamation potential is questionable on 229 acres that are in land capability Classes VII and VIII, because of topography, depth to bedrock, rock outcrops and steepness of slope. Direct impacts to the soil from mining disturbances would be the same as described in the section on soil impacts from coal mining. With proper mitigation, there would be no impacts to the soils resource after reclamation.

The potential to implement mechanical treatments on 587 acres in Buffalo Creek would cause losses of 25 acre feet of soil to wind erosion. This is a short-term loss of soil, but would be insignificant in the long term.

Summary

The cumulative loss of soil from coal mining and vegetation utilization actions would be 43,901 acre feet (43,704 and 197 acre feet, respectively). The losses from these actions are irretrievable, and would be insignificant with proper mitigation. Impacts from land and wilderness actions would be insignificant.

Wildlife

Coal development on all 993,591 acres would result in significant local impacts to wildlife, even if mitigation for the loss of wildlife habitat were successful. Wildlife habitat mitigation required under state and federal regulations would limit most impacts to the mining and reclamation phase. As mining occurs, wildlife habitat would be destroyed; that would be a significant impact. Each of the 22 current federal coal leases identifies wildlife concerns where they occur within each lease.

BLM coal planning prior to 1982 identified 1,619 acres of sharp-tailed grouse, sage grouse and antelope habitat for which mitigation would be required. The 1982 MFP Amendment identified 3,004 additional acres of critical wildlife habitat for which mitigation would be required. This includes sharp-tailed and sage grouse leks and sage grouse and antelope wintering areas.

In addition to these impacts, the following habitats would be impacted:

(1) In the vicinity of Decker and in the uplands west of the Tongue River Reservoir, 16,000 acres of mule deer and antelope winter ranges, sharp-tailed and sage grouse leks, sage grouse wintering areas, prime turkey, antelope and mule deer habitats;

(2) In the Tongue River uplands from the Rosebud-Custer County line to the Wyoming border, 29,800 acres of prime turkey and mule deer habitats;

(3) In the headwaters of the Hanging Woman and Otter Creek drainages, 28,000 acres of sharp-tailed and sage grouse leks, prime antelope and mule deer habitats;

(4) In the Powder River uplands from Broadus to Moorhead, 280,000 acres of prime mule deer habitat;

(5) In Rosebud and Big Horn Counties, north of the Northern Cheyenne Indian Reservation, 2,800 acres of sharp-tailed grouse leks, prime antelope and mule deer habitats;

(6) In the Pine Hills, east of Miles City, 320 acres of sharp-tailed grouse leks and bighorn sheep habitats;

(7) In the Pumpkin, Mizpah and Foster Creek drainages, 14,000 acres of sharp-tailed and sage grouse leks, prime antelope and mule deer habitats.

These figures are best estimates, because of the large acreage pending further study. Critical wildlife habitat will be given consideration in the application of unsuitability criteria to these areas.

Total restoration of some habitat types, such as 191,000 acres of steep breaks and woody draws, has not been fully demonstrated. Areas that are reclaimed would have the potential to produce high quality spring and summer habitat.

During mining, development and increased harassment woud cause movement of wildlife species to less disturbed habitats. Increased human activity would result in increased poaching. These impacts would be significant during the mining and reclamation phase.

Species distribution would return to a more natural state with the completion of reclamation. Because it has not been demonstrated that all types of wildlife habitat can be reclaimed and because of the large amount of acreage involved, impacts to wildlife would be significant even after reclamation activities.

Although no major fisheries would be directly impacted, the watersheds in the potential mining areas do influence water quality of Yellowstone River tributaries. Each of these is important to the local sport fishery, and impacts caused by mining could be significant. Mitigation during and after mining should target potential siltation and water quality and flow problems.

All known threatened and endangered species use areas were eliminated from further lease consideration in the application of unsuitability criteria, where inventory was complete. After application of the unsuitability criteria to the areas pending further study, all known threatened and endangered species use areas will have been eliminated from further consideration. Increased development and human activity would result in increased disturbance of transient threatened and endangered species, including bald eagles and peregrine falcons, which may migrate through developed areas.

Any emergency leases or coal exchanges which may develop under this alternative must be considered on a case-by-case basis, to assure the protection of critical wildlife habitat.

Vegetation use of 624,249 AUMs in the short term and 700,161 AUMs in the long term for wildlife and non-consumptive uses would be favorable to wildlife. There would be no significant impacts on wildlife during the short term. Mitigation measures and project stipulations on range developments would result in an overall benefit to wildlife. In the long term, range condition would improve and, in most cases, would result in improved wildlife habitat.

Mechanical treatments of up to 125,023 acres would have significant short- and long-term impacts on wildlife habitats because of the large amount of land involved. Vegetation manipulation would alter the wildlife population density and diversity in the treated areas. All wildlife would be displaced temporarily. The expected 15% increase in succulent spring grass and forbs would benefit some species seasonally. However, decreased vegetative diversity would reduce the abundance and diversity of wildlife species. Big sagebrush habitat, critical to antelope and sage grouse survival, would be evaluated on a case-by-case basis to protect that resource.

Since wildlife concerns would be addressed in each of the 72 potential activity plans, impacts from disturbance or destruction would be minimal. Range improvements totaling 410 projects would displace wildlife temporarily on 572 acres, due to habitat disruption and increased human activity. Developed water sources would be beneficial to wildlife. They would help break up heavy concentrations of livestock at overused watering sites and would provide additional water sources for all forms of wildlife.

Care would be used in selecting water development sites to avoid damage to important wildlife use areas such as woody draws.

Construction of 100 miles of fence would result in better distribution of livestock. Fences would be constructed so as to minimize movement barriers to big game by utilizing standards outlined in BLM Manual 1737. If fences are built in big game wintering and concentration areas, there would be significant short- and long-term impacts.

Increased wildlife/livestock competition in areas to which livestock are redistributed would be offset by increased residual vegetation available in the areas from which the livestock are moved.

Grazing systems which provide spring rest or deferment would improve the quality and quantity of forage, especially forbs, and would make them more available to deer, antelope, bighorn sheep and grouse. The quality and quantity of nongame forage and cover would increase as a result of grazing treatments.

Upland game birds require the residual vegetation usually found in areas of light or no grazing, for nesting and winter survival. Through the use of grazing systems or treatments to provide greater distribution of cattle, residual cover would be decreased in the current low or no use areas. However, this would allow for greater vegetation production in the current high use and concentration areas to offset the loss.

Additional residual vegetation and greater vegetative production due to the use of grazing and land treatments would help upland nesting waterfowl. Residual vegetation for nesting and brood rearing would be available near reservoirs and in rested or deferred pastures.

Fencing approximately 21 of the new water developments would benefit nesting birds by providing cover to eight acres of residual vegetation for cover at each site.

The average annual installation of 20 bird ramps in stock tanks would be beneficial to all small wildlife species that use these water sources. The ramps help prevent the drowning of small animals. The continuing construction and placement of an average of 20 bird nest boxes and 10 goose nesting platforms annually would benefit mainly waterfowl, kestrels and bluebirds. The average annual construction of one livestock exclosure around a new pond development would benefit waterfowl by providing undisturbed nesting cover. The continued stocking or restocking of gamefish in two stockponds annually would benefit the general public by maintaining good fisheries. Reservoirs identified as suitable for recreational fishing would be fenced to provide and maintain a quality fishery. A tank, water gap or other means of livestock access to water would be provided.

Maintaining woody riparian reproduction in areas to provide 30% of the woody species as saplings or younger trees would assure continued age class diversity in the system. This would assure the availability of browse for use by wildlife through winter months.

Control of 40 acres of prairie dogs would further reduce the known prairie dog acreage by 1.5%. There is concern that as this natural habitat is further reduced, the prairie dog and associated species would reach dangerously low population levels, locally as well as regionally.

The treatment of 130 acres of noxious weeds, particularly Canada thistle, would reduce the available food for seed-eating birds. The small acreage treated would have minor impacts on wildlife.

Implementing prescribed burn plans on 20 acres annually and modified fire suppression plans would eliminate some dense vegetation. Although some wildlife species do require dense trees or shrubs, extensive areas of dense vegetation could be of greater value to wildlife if it were thinned with scattered openings.

There would be no significant impacts on threatened or endangered species. Each range improvement project would be surveyed for the occurrence of threatened or endangered species; recommendations would be made for appropriate mitigation or project stipulations. Any control of prairie dogs would decrease the potential habitat for black-footed ferrets.

Disposal of 165,054 acres would mean the loss of BLM control on that wildlife habitat. The lands program also offers potential for the exchange of lands having equal or greater wildlife habitat values, which would benefit from public ownership. With over 15% of the public lands considered for disposal, there would be moderate negative impacts on wildlife habitat, depending on the vehicle for disposal. These losses would be greater, with a higher percentage of sales rather than exchanges. In exchanges, little significant wildlife habitat would likely be lost, and some may even be gained. In lands sales, consideration would be given to major wildlife concerns, but BLM would lose control of any wildlife habitat which would be sold. Since major wildlife concerns would be addressed on a case-by-case basis early in the discussions of any land exchange or sale, significant impacts would be considered in the decision process. Those impacts would be reduced or mitigated as much as possible. Threatened and endangered species habitat would be given special consideration before any land transactions, to avoid adverse impact to threatened or endangered species. Overall, the impacts from lands actions would be significant.

Recommending Zook Creek as suitable for wilderness designation would protect the known sharp-tailed grouse, turkey and mule deer habitat. However, the mere designation of a block of land as wilderness does not automatically imply either benefit or detriment to wildlife. A large block of land without vehicle access does provide a secure area for wildlife. On the other hand, the lack of vehicle access to large blocks of land often results in the loss of game harvest as a wildlife management tool.

Recommending Bufffalo Creek as nonsuitable for wilderness designation would allow possible development of the oil and gas resources, ORV use, range improvements, and post and pole cutting. There would be localized insignificant adverse impacts to nesting raptors.

Opening 5,650 acres to coal development would have significant impacts on nesting raptors due to habitat destruction and disturbance during mining. The long-term impact in this area would be insignificant if mitigation measures were successful. Application of the coal unsuitability criteria would protect threatened and endangered species as well as species of special concern to state and federal agencies.

The identified environmental consequences on these two specific areas are based on extensive but incomplete inventory data; these site specific consequences cannot be extrapolated to the entire resource area where the habitat diversity is vastly greater.

Summary

There would be significant impacts on wildlife due to destruction and disturbance of wildlife habitat from coal mining actions, because of the large amount of acreage involved. The cumulative impacts from vegetation utilization actions would be beneficial to wildlife, except for the negative impacts due to extensive mechanical land treatments. There would be significant impacts on wildlife due to the loss of habitat, which might be sold in the land actions. Wilderness actions would have insignificant impacts on wildlife.

Cultural Resources

Based on projections from inventoried lands, from 3,300 to 9,900 cultural resource sites would be affected if all coal areas considered are mined. Previous evaluations of cultural resources indicate that between 5% and 20% of these sites may be significant and eligible to the National Register of Historic Places.

Impacts of coal mining would be minimal once prescribed mitigation in laws, regulations and policies pertaining to cultural resource management were followed.

Improved range condition would generally benefit cultural resource sites by increasing ground cover and reducing erosion. However, some developments such as mechanical treatments and burning would destroy the context or structure of a site. Mitigation through existing policies, however, would minimize the impacts of ground-disturbing treatments on cultural resource values.

Lands identified for potential sale, exchange or other disposal action would be inventoried for prehistoric and historic sites. Through existing policies fir mitigation, the effects on cultural resource values would be minimal. Through exchanges, cultural resource values could be gained.

Generally, prehistoric sites and some historic sites and features are compatible with Zook Creek designated as wilderness. Some historic sites may qualify as features which enhance the quality of the natural environment or may serve as a facility for a permitted activity. The principal adverse effects of wilderness designation could include unmonitored natural soil erosion, vandalism, and natural deterioration of structures and features. Applying existing mitigation policies would minimize the effects on the cultural resource.

There has been no intensive inventory of the cultural resource of Buffalo Creek to suggest direct impacts. Sites which could exist in the area would be subject to the impacts of continued multiple use management. Applying existing mitigation policies would minimize the effects on cultural resources.

Summary

The impacts of all actions on cultural resources would be minimal.

Paleontologic Resources

Impacts on the paleontologic resource by coal mining would be minimal. Plant and mollusk fossils are widespread and common throughout the mineable portions of the Fort Union and Wasatch formations. However, two significant vertebrate fossil localities are recorded in the area of coal with development potential. More undiscovered localities may exist.

Paleontologic resources would be little affected by vegetation utilization actions. Some trampling of significant localities by livestock would occur. Avoidance or collection of paleontologic material when constructing range projects would occur on a case-by-case basis. Special emphasis would be placed on projects located in the Hell Creek formation to avoid damage to significant localities.

Approximately 19,000 acres or 12% of the 165,054 acres identified for disposal and 570 acres or 21% of the 2,760 acres identified for further study fall within the exposures of the Hell Creek formation. A potential loss within the Hell Creek formation would occur on 9,785 acres due to sales and 9,785 acres due to exchanges. In a "worst case" situation with no mitigation measures applied to the exchanges, there would be a total loss of public management of paleontological resources on 19,570 acres (21% of the Hell Creek formation exposed on public land).

There would be no impact on the paleontologic resource from wilderness actions.

Wilderness

ZOOK CREEK WILDERNESS STUDY AREA

No direct impacts due to coal mining would occur to the Zook Creek WSA. Mining is possible within several miles of the WSA. Most likely, impacts would be insignificant. As a worst case (if all acceptable areas were mined), offsite activities would diminish the wilderness characteristics of naturalness and outstanding opportunities for solitude. This would be a significant indirect impact.

Oil and gas development on 5,831 acres of pre-FLPMA leases is not likely. If it occurred, it would significantly affect the naturalness of the area. Oil and gas development on 2,607 acres of post-FLPMA leases would have no impact on wilderness characteristics.

Management of vegetation in Zook Creek, including maintenance of projects, would not impair the wilderness characteristics of the WSA.

There would be no impacts on wilderness characteristics from range developments or surface treatments outside of the WSA.

There would be no impacts on wilderness characteristics from lands actions outside of the WSA, except if public access were gained through land exchanges.

There would be no impacts on wilderness values due to offroad recreational vehicle use, forest management, or inventory and management of cultural resources.

The wilderness characteristics of Zook Creek would be preserved. This designation would increase the diversity of the National Wilderness Preservation System and include a Great Plains short grass prairie, eastern ponderosa pine area in the system.

The area is manageable as wilderness. This is due to the configuration of the area, the absence of inholdings, and the anticipated absence of development of coal near the WSA or pre-FLPMA oil and gas leases.

BUFFALO CREEK WILDERNESS STUDY AREA

The area would be acceptable for further consideration for coal leasing pending further study. In the short term, coal leasing and mining of the Buffalo Creek area is unlikely and therefore, no effects on the wilderness characteristics are expected. However, as a worst case, 55 million tons would be mined on 5,650 acres and the wilderness characteristics irreversibly and irretriveably lost.

Mining is possible within several miles of the WSA. Most likely, impacts would be insignificant. As a worst case (if all acceptable areas were mined), offsite activities would diminish the wilderness characteristics of naturalness and outstanding opportunities for solitude. This would be a significant indirect impact.

There would be a possibility in the long term, that oil and gas development on 5,650 acres would degrade the naturalness of the area. This would be a significant impact.

Management of vegetation in Buffalo Creek, including maintenance of projects and the construction of two miles of fence, would not impair the wilderness characteristics of the WSA.

There would be no impacts on wilderness characteristics from range developments or surface treatments outside of the WSA.

There would be no impacts on wilderness characteristics from lands actions outside of the WSA, except if public access were gained through land exchanges. The 150 days of off-road vehicle use per year would continue and have insignificant impact on the naturalness of the area.

There would be no impact to the wilderness resource due to forest management in the short term. There would be an insignificant impact on the wilderness characteristics of naturalness from incidental post and pole cutting in the long term.

Summary

Buffalo Creek would retain its wilderness characteristics in the short term.

Coal or oil and gas development, if it occurred, would degrade the wilderness characteristics of naturalness, in the long term.

The opportunity to expand the diversity of the National Wilderness Preservation System by designating an example of the Great Plains short grass prairie eastern ponderosa pine ecosystem would be foregone, as there are no such examples currently in the system.

Lands

There would be no impacts on the lands resource resulting from coal mining, vegetation management or wilderness actions.

Sales of isolated, inaccessible tracts would result in an irretrievable loss of 82,362 acres from public ownership. Most of these lands are small, isolated tracts unuseable by the public and unmanageable as part of the public land system. Sales would restrict the opportunity to acquire or preserve other land resources by exchange. Exchanges of 82,361 acres would result in a significant increase in management efficiency and public use by consolidating isolated, inaccessible tracts, acquiring access to bodies of water and large tracts, and acquiring land or easements for preservation of cultural, historical, paleontological and recreation sites. This action would reduce administrative costs for maintaining these small, isolated tracts and retain a balance of natural resources. Disposal under the Recreation and Public Purposes Act results in a significant beneficial use by the public.

Summary

There would be no impacts from coal mining, vegetation management or wilderness actions. There would be a moderately beneficial impact from land transactions.

Recreation

If all areas were mined, 38,000 acres near the Tongue and Powder Rivers having scenic value and 200 acres having local historical value (Battle of Hanging Woman Creek) would be irreversibly and irretrievably lost. Because of the loss of hunting opportunities on up to 993,591 acres during mining and reclamation, there would be additional hunting pressure on surrounding private and public lands. These would be significant impacts. However, after successful reclamation this would be an insignificant impact. About 84.5% of all federal coal with development potential lies under private surface, and recreational use is governed by the surface owner. Any additional limitations on the general public because of mining would be insignificant.

The 300 additional reservoirs and pits would improve hunting potential through the dispersion of wildlife and would increase the fishing resource. The 50 two-mile sections of fence would inconvenience hunters by restricting their movements. This would be an insignificant impact. Mechanical treatment of 125,023 acres would result in localized short-term reductions in hunting habitat, which would be an insignificant impact in the long term.

Recreation, especially hunting and wildlife observation, would benefit from the woody riparian vegetation management techniques. The control of prairie dogs and noxious weeds, and prescribed burning would result in no impacts.

The sale of 23,579 acres in the short term and 82,362 acres in the long term would result in an insignificant impact to recreational opportunities. These lands are generally isolated from the public due to the lack of access. The exchange of 23,579 acres in the short term and 82,361 acres in the long term woud allow public land to be consolidated, and access gained to isolated tracts and bodies of water. Also exchanges would aid the Montana Department of Fish, Wildlife and Parks in meeting its objectives of gaining access to bodies of water, access to public land for hunting purposes and continued consolidation of public land at or near significant historical sites. Increased access to public lands and bodies of water would aid the BLM in meeting the long-term demand for recreation. Therefore, exchanges would have beneficial impacts. Recreation would benefit from R&PP actions. However, the resource would be managed by agencies other than the BLM.

Recommending Zook Creek as suitable for designation as wilderness would prohibit the use of off-road vehicles, therefore, hunting would be affected in the short and long term. Zook Creek has minimal ORV use; therefore, this impact would be insignificant. There would be a benefit to scenic resources in the area because of the general absence of surface disturbing activities. Wilderness designation would enhance all types of compatible nonmotorized recreation in the long term.

Recommending Buffalo Creek as nonsuitable for wilderness designation would have no impacts. Hunting and off-road vehicle use would continue at current levels. However, nonwilderness designation of Buffalo Creek could result in coal mining in this area in the long term. The scenic value of this area would be irreversibly and irretrievably lost due to coal mining. In relation to the surrounding area, this would be an insignificant impact.

Summary

The cumulative impacts of coal mining actions on recreational opportunities would be significant. The vegetation management actions and wilderness actions would be insignificant. There would be moderately significant impacts from lands actions.

Air Quality

Concentrations of TSP would be elevated in the vicinity of any mining activity. Depending on the situation, average annual concentrations of TSP at the mine area boundary would range from 20 to 90 mg/m³ and second highest 24-hour concentrations would range from 75 to 260 mg/m³. These concentrations would fall back to one mg/m³ above baseline levels at a distance of two to nine miles from the active mine area, in worst case situations (PEDCo SSAs 1983). Under the worst case situation, mining could occur to the degree that adjacent mines would be close enough to each other that their emissions would be cumulative. Cumulative emissions from adjacent mines would violate the state 24-hour ambient air quality standard of 200 mg/m³ in some cases. Increases in particulate and gaseous pollutants would be a phenomenon that would be insignificant except in the immediate vicinity of active mining. Successful land reclamation would eliminate degradation of air quality. Impacts resulting from the proposed action would be limited to degradation of air quality and insignificant climatological changes during mining and reclamation. Increments of TSP are not consumed by mining, under the PSD ruling, unless the mining occurs within a designated impact area of a major polluting source. There are no such impact areas for TSP in the Resource Area now, consequently no mining activity will consume TSP increments either in the Resource Area or in the Northern Cheyenne Indian Reservation Class I area. Mining could affect AQRV on the Class I area. The AQRV most likely to be affected by mining would be visibility. The visibility reduction modeled for the closest proposed coal tract to the Reservation was an imperceptible and insignificant 0.7 percent.

Fugitive dust generated by wind erosion on the moderate to severely susceptible soils has elevated TSP to an average background concentration of 15 mg/m³; this would continue on a long term basis. Land treatments increase surface exposure and raise fugitive dust concentrations to about 30 mg/m³ over the short term, until vegetation is well established. Increased vegetative production would have a positive effect on reducing fugitive dust generation from wind erosion. There would be a 27.3% reduction in TSP for 14.8% of the land area, resulting in a concentration for those lands of about 12 mg/m³.

Meteorological conditions, such as inversions, sometimes permit high concentrations of particulate matter to acccumulate in localized areas. However, they are small in scale and quickly dispersed. In the long term, land treatments would enhance air quality by reducing TSP concentrations to about 10 mg/m³ for range in excellent condition. Chemical control of noxious weeds could produce very localized, short-term, virtually unmeasurable impacts to air quality by drifting in and around the treatment areas. Prescribed burning would elevate the concentration of airborne particulate matter in localized areas over the short term. Concentrations of particulates eight hours after the burn would be on the order of 500 mg/m³ and this would be reduced to 20 mg/m³ above background within 24 hours of the burn. Impacts from all the described activities are considered insignificant in that they rarely, if ever, result in the violation of standards. Certainly no irreversible commitment of the air resource is posed by these land management practices .

Lands involved in sales or exchanges could be farmed once they come under private ownership. These actions would only contribute minimally to air quality impacts currently being experienced. Otherwise, there would be no impacts on air quality as a result of lands actions.

Wilderness designation of Zook Creek WSA would have insignificant impacts on air quality. Buffalo Creek WSA would not be designated as wilderness, therefore, 5,650 acres could be mined for coal. Degradation of air quality from any energy development would be limited to acceptable levels by state and federal standards and would not threaten the current air quality in the Buffalo Creek WSA.

Summary

Coal mining actions could affect AQRV on the Northern Cheyenne Indian Reservation, a Class I area. The AQRV most likely to be affected would be visibility. Cumulative emissions from adjacent mines could violate state 24-hour ambient air quality standards on several occasions. Impacts from any vegetation management actions would be insignificant in the short term and would be beneficial in the long term. No impacts to air quality would be experienced from lands actions, except where lands are developed for farming. Wilderness actions would have insignificant impacts on air quality.

Forestry

Approximately 49,140 acres of commercial and noncommercial (woodland) forest on public surface would be irreversibly and irretrievably lost if all areas were mined, assuming that there continues to be no proven reclamation techniques that can successfully reestablish ponderosa pine forests on previously mined land. This figure is 37% of the total amount of BLM administered forest land and represents six percent of the total federal and Indian forest lands in the Resource Area. Since the Resource Area has no established allowable cut, the loss of public forest land would not impact the Bureau's forestry program during mining and reclamation or after reclamation. However, the amount of Bureau forest resources available for incidental sales of firewood, Christmas trees, sawlogs, and posts and poles would be significantly reduced. In addition, the loss of forest cover would significantly affect other Bureau programs, especially wildlife and recreation. Approximately 90,850 acres of forests on private surface over federal coal would be lost if all areas were mined. The impacts due to the loss of private forest land would be essentially the same as the loss of public forest land.

The cumulative impacts from the combined loss of public and private forest land would be insignificant to the forest products industry.

There would be no impacts to the forest resource from any of the vegetation utilization actions.

A maximum of 17,686 acres of commercial and noncommercial (woodland) forest land would be removed from public ownership as a result of sales or exchanges where no similar land is acquired. This figure is 13% of the forest land administered by the BLM and represents two percent of the total federal and Indian forest land (excluding state and private). Since exchanges would be equally considered with sales, it is likely that the total acreage would not be affected.

In the event that the maximum amount of forest land (17,686 acres) is removed from public ownership, the Bureau's forestry program would not be impacted in the short or long term, since the Resource Area does not have an established allowable cut. However, the amount of forest resources available for incidental sales of firewood, Christmas trees, sawlogs, and posts and poles would be reduced, perhaps significantly in some areas.

Approximately 4,900 acres of commercial and noncommercial (woodland) forest land would become unavailable due to designation of Zook Creek as wilderness. The impacts to the Bureau's forestry program would be insignificant, since the Resource Area does not have an established allowable cut. However, the amount of forest resources available for incidental sales of posts and poles would be reduced. There would be a small positive impact in the long term in the Buffalo Creek WSA, since this study area would be open to a wider range of forestry management options, including post and pole sales.

Summary

Cumulative impacts on the forest products industry would be insignificant, because the impacted forests are not of high quality and are not in demand. However, a significant amount of public and private forest land would be irreversibly and irretrievably lost due to coal mining. A lesser amount of public forest land would be made unavailable due to land and wilderness actions. There would be no impacts from vegetation utilization actions.

Agriculture

If all areas were mined, 47,301 acres currently utilized as cropland would be affected. Maximum annual loss during mining and reclamation would be 1,267,667 bushels of winter wheat or 66,221 tons of alfalfa hay. These losses would not have a significant effect on regional agricultural production; however, individual operators could be significantly impacted.

Annual soil disturbance from mining (600—1,000 acres) at current and projected rates of production would not exceed that acreage presently left bare annually due to summer fallow (2,000—2,500 acres) in the areas of coal with development potential. Preliminary indications from completed and ongoing reclamation research are that impacts after reclamation are not significant, since agricultural productivity of mined land can be restored. (Gilley et al 1982, Pole et al 1979, Power et al 1981).

Vegetation utilization actions would have no impact on agriculture.

Sale or exchange of 164,723 acres could include some or all of the 637 acres of public land currently utilized as cropland and tame pasture. There are 14,619 acres in the short term and 51,064 acres in the long term that have potential to be plowed and are in land capability Class III and IV.

There would be no impacts from wilderness actions because there is no agricultural use in the WSAs.

Summary

The cumulative impact on regional agriculture would be insignificant. However, coal mining actions could have a significant impact on some individual operators. Land actions could have a beneficial impact on some individual operators. There would be no impacts on agriculture from vegetation utilization or wilderness actions.

Economics

This alternative identifies additional coal that has not been identified in previous planning. Impacts from developing any of this additional coal would be in addition to those impacts identified in previous discussion. (See Tables 4-6 through 4-16.)

Since there have been no expressions of interest by industry and tracts have not been delineated, it is not possible to identify where and when coal would be leased and mined. After a potential mine area has been identified by industry, there are tract profiles, a regional EIS and permit EISs that must be written, which will provide community leaders and planners with more accurate information to properly plan for impacts.

Coal is available for further consideration for leasing in the areas north, south and east of the Northern Cheyenne Reservation. (See Alternative B Map in map folder).

The impacts from mining additional coal that have not been identified in previous planning would affect each of these areas differently.

If additional coal is mined north of the Northern Cheyenne Reservation, the communities of Hardin, Forsyth and Colstrip would be most heavily impacted. The past experiences of these communities in accommodating coal development would help to minimize these impacts. These communities have much of the necessary infrastructure and primary services in place. Other additional services could be expanded at reasonable costs to support additional growth.

Additional coal development in the area south of the reservation would most heavily impact Birney, Decker and Sheridan, Wyoming. This area in Montana is sparcely populated and as in the past, miners would most likely reside in Sheridan, Wyoming with little expected growth to Birney or Decker. Sheridan also has much of the infrastructure and primary services available to support additional growth. Sheridan may be required to go to the Wyoming Legislature for additional funding to support further growth.

The area east of the reservation would have the most difficulty with coping with impacts from additional mining. The communities of Ashland and Broadus in Powder River County to date have not experienced rapid growth from coal development. By the time that the additional coal identified in this document reaches the leasing stage, these communities could be experiencing growth due to development of mines resulting from the 1982 and 1984 Federal coal lease sales and the development of the proposed MONTCO mine.

These communities have not had the experience that communities identified in the north and south sectors have had with coal development. The 1980 population of the communities, Broadus (715), Ashland (approximately 400), are small in comparison to the other impacted communities. Due to their small size, impacts would be relatively greater. These communities also would need to establish lines of communication with State agencies and the Montana Coal Board as have the other impacted communities.

Powder River County does not have an established tax base from coal development as do Rosebud, and Big Horn Counties. Consequently, this county may have severe problems supporting this additional impact during the early years of development until tax revenue starts coming in from coal production.

Additional coal development on or near the Northern Cheyenne or Crow Reservations will impact the reservations both positively and negatively. Additional mines may provide additional job opportunities for the Northern Cheyenne and Crow Indians but at the same time will bring more people into the area causing additional disruption to the lifestyle and fiscal requirements of the Indians. The community of Lame Deer would probably receive the greatest impact.

Figures are provided in Table 4-2 for use by community leaders and planners for each additional million tons of coal proposed to be mined. These figures are then used to compute the requirements for a five million ton per year mine in Table 4-3.

The state's share of federal royalties, the state severance tax and the increased county tax valuation are portrayed in Table 4-4. The increased tax valuation only applies to the county and school district where the coal is mined. Plant and equipment is estimated at $5,000,000 per million tons mined. The increased valuation would be taxed at the county mill levy and the school district mill levy. Although this increase would help to meet expenditures, there is a one to two-year delay from the time of the initial impact to the time of the collection of additional taxes.

The State Severance Tax Impact Fund provides the Montana Coal Board with money to assist impacted areas. This is currently 8.75% of the severance tax collected on each ton mined. In our example of a five million ton mine at $7.83 per ton (1980 data—Powder River II Coal EIS), the 30% severance tax would provide $11,745,000 of increased revenue per year. Of this amount, over $1,000,000 is available to the Coal Board. Impacted entities must apply to the Coal Board for this money.

Indian reservations and communities can also apply to the Coal Board for impact funds. They must compete with state agencies for this money, which totals seven percent of 8.75%. A five million ton mine would provide an additional $71,938 per year.

In FY 1984, the Office of Budget and Planning for the State of Montana estimates that severance taxes will provide $98,654,000. The impact fund for Indian tribes and state agencies amounts to $604,240. These annual figures would increase as production and/or the price of coal increases.

The additional 160,024 acres of public rangeland in good condition could support 25,304 additional AUMs for livestock if needed in the long term and 75,912 AUMs for wildlife, watershed protection and other nonconsumptive uses. The estimated cost of range improvements is $6,465,960, based on the current average cost per improvement. This is equal to an average cost of $6.93 for each AUM. Preference values would increase by $2,530,400 (12% increase) on those ranches that would be improved, should the additional AUMs ever be allotted.

The disposal of up to 47,158 acres in the short term and 165,054 acres of land in the long term by sale, exchanges, exchange pooling, or jurisdictional transfer to other federal agencies would affect the number of AUMs that the BLM leases within the Resource Area. The AUMs would not be lost, necessarily, as the new owners would still have the same amount of forage available.

This action would reduce some of BLM's management costs in the Resource Area. This would be accomplished by eliminating isolated tracts or blocking up land for more economical management.

Land disposals could affect County revenues because of differences in lieu of taxes (PILT) and county taxes. Impacts would be insignificant.

At Zook Creek, there would be additional ranch labor costs associated with the general prohibition of motor vehicle use for range development maintenance. Income to each of the three permittees would decline about $200 per year.

The value of federal coal being mined in the vicinity is about 25 cents per ton to the federal government. This is calculated by discounting the federal bonus and royalty payments on $10 per ton coal. (See Appendix O.) On this basis the value foregone of the 464 million tons of coal with development potential would be $166 million. However, because of large quantities of more desirable coal in the general area, this value is a comparatively small factor and may be overstated for revenues which could be generated at Zook Creek.

There is no economic value to the timber resource as harvest costs would outweigh the timber revenues.

There would be no economic impact from recommending Buffalo Creek as nonsuitable for wilderness designation.

Social Impacts

If the coal market were to improve and much of the coal identified for lease consideration were eventually developed, the region's economic base could change greatly. The region's economy could become clearly dominated by coal development with agriculture playing a reduced role. This would have important impacts in the social make-up and structure of certain communities and counties. The rural communities would lose their close-knit face-to-face informal social interaction and this would be replaced with more formal mechanisms of integration. Growth tends to lead to increasing bureaucratization of social structures, and many social relationships may change from personal to impersonal (Kremmling RMP 1983). Agricultural customs and culture could be replaced by more urban forms. Newcomers from the coal industry could fill many political seats once occupied by ranchers.

If much of the coal acreage considered acceptable for further study were developed, there would be significant social impacts in Powder River, Big Horn and Rosebud Counties. Significant impacts would be experienced in Broadus, the Ashland-Otter Creek-Birney area, Forsyth, Colstrip, Hardin and Sheridan due to the magnitude of population increase. Social organization, integration and services would be severely impacted. Powder River County, instead of continuing to lose population through out-migration, would gain population through in-migration. Young people from the county would be more inclined to stay because there would be more employment opportunities for them. There would be more employment opportunities for people in Custer and Treasure Counties as well. This would change the existing demographic profile in Custer and Treasure Counties and increase the proportion of the population in the 18 to 45 age bracket.

Under a maximum coal development scenario, both the Northern Cheyenne and Crow reservations could be affected. The development of new mines within commuting distance of the reservations could help solve an important social problem of both tribes, unemployment. However, there would be trade-offs involved. A large population influx of non-Indians living in proximity to either reservation could substantially increase the Native American cross-cultural contact, increasing cultural disintegration. As Native American communities, the Crow and Cheyenne are inherently more vulnerable to the impacts of industrialization than are predominantly white communities. Also, the Crow and Cheyenne seem to value an unspoiled physical environment very highly. Their relationship to their physical surroundings seems to be an important part of their cultural heritage. Depending on the size, timing and location of the mines, environmental degradation could occur near the reservations.

The worst case coal development is an unrealistic scenario given current market conditions. Most likely this alternative would cause few additional impacts other than those outlined in Alternative A. Most likely, this alternative would give the coal industry more flexibility in where to develop coal tracts rather than adding drastically to the total coal mined.

The effect of this alternative would be to make development more likely for certain areas that would not be open for development under Alternative A.

This alternative opens up coal for lease consideration in the Pine Hills area, which is approximately 10 to 15 miles east of Miles City. A mine, if developed there, would probably produce two million tons per year or less. Given that Miles City is already a main service center for the Resource Area, it is expected that social impacts to the community would be insignificant. A small mine would probably add a needed employment base without causing a drastic population increase. Miles City is socially a much more diverse community than many other communities and has more potential for handling added growth well. Even if the Pine Hills area were not mined, Miles City would continue to grow in importance as a service area for surrounding coal development. Miles City has a city-county land use planning office and a comprehensive plan to help guide future developments.

Another area opened up for lease consideration in this alternative is the Pumpkin Creek area, approximately 20 miles west of Broadus. Development of a mine in this area may certainly increase potential social and services impacts on the Broadus community. The lack of recent land use planning efforts makes Broadus potentially vulnerable to rapid growth from coal development. Town and county officials seem to be taking a wait and see approach to potential coal development.

Another area opened for lease consideration is the Terrett Ranch, which is north of Cook Mountain. This area may have a good possibility for development if the Tongue River Railroad is built. This area is approximately 15 miles north of Ashland and 25 miles east of Colstrip. If developed, this area could add further population impacts to Ashland and Colstrip.

There is a good possibility that the general social well-being of ranchers who use BLM land for grazing would be improved, because range conditions would be improved.

Depending upon whether lands are sold or exchanged, there is a potential for both increasing and lowering the social well being of certain ranchers who use BLM land for grazing. There is the potential for increasing the operator's social well being if he gains the BLM land through sale or exchange. This may increase the operator's control over land he may have used for years. Another positive social benefit may be to local governments and communities that accrue more taxes from these isolated tracts.

One social consideration has to do with futures foregone. Land use decisions not only affect present land use, but also help shape decisions that are possible for the future. Other things being equal, a decision that restricts future options is socially less desirable than one which leaves future choices open. In this context, land pattern adjustment may be a more flexible approach in leaving future choices open than the other alternatives. Under this alternaitve, the total amount of acreage the BLM oversees will remain about the same. Most likely, as a future option, it would be easier to sell BLM land than to buy the land back if needed. It is quite feasible as resources become more scarce that federal land will continue to increase in value, not only fiscally but as a recreational and social resource. The greater flexibility of this alternative is also apparent in that it provides for substantial exchange of lands to improve recreational and wildlife values and to block up public land for better management.

Sale as a method of land disposal may have more potential for negative impacts. If land adjacent to current operators is sold, even under modified bidding procedures, the operator may not be able to afford to purchase the land. BLM land sales would have more potential for negatively impacting the small rancher or those with heavy debt loads, than the larger, wealthier ranchers.

Exchange as a land disposal practice may have less likelihood of inequitable impacts. There is still the possibility that if land adjacent to current operators is exchanged to someone else, it may harm the operator's ranching operation. Three-way trades or land exchange pooling may somewhat mitigate this possibility. If exchanges are used to improve access to public land, regional recreational and hunting opportunities would be enhanced.

There would be minimal social impacts resulting from wilderness actions.

Coal

A maximum of 69.81 billion tons of coal with development potential, plus any additional coal mined as a result of emergency leases, would be irretrievably and irreversibly lost by mining. It is anticipated that the demand for coal in the future will be much less than the total available. Most areas cleared in planning would not be delineated into tracts for possible leasing. Also, it is highly unlikely that all coal with development potential would be mined, because currently, coal companies rarely extract coal under more than 200 feet of overburden, whereas coal with development potential has up to 500 feet of overburden.

Exchange of coal for coal in alluvial valley floors and through legislative dictums could remove a significant amount of coal from development potential status. These exchanges are mandated by law and regulation and are not discretionary. In addition, this alternative would allow coal exchange on a case-by-case basis. Although exchanges would be limited to equal value, in the short term, significant impacts could occur to federal coal royalties. This would result if checkerboard federal coal areas were acquired and mined by a private entity controlling adjacent sections, at a time when the coal market was too limited to absorb leasing of an additional tract of completely federal coal delineated as a result of the exchange. In the long term, the federal coal would be mined and royalty impacts would be insignificant. Exchanges may also compensate the federal government by providing resources other than coal to the public domain.

There would be no impacts on the coal resource from vegetation utilization actions. Impacts could occur to the availability of the coal resource if sale or exchange of the surface permitted the new surface owner to deny consent to mine underlying federal coal. However, since areas of currently defined coal with development potential have all been placed in the "retention" category, the acreage involved would be small and impacts would be insignificant. It is possible that some of the 164,723 surface acres proposed for sale or exchange could occur in areas with unknown coal potential. A significant loss of potential revenues from federal coal could occur if areas of unknown coal potential were disposed of. Coal ownership would be retained if the lack of coal were not demonstrated in the site specific mineral report required for each disposal action. However, disposal of the surface could affect surface owner consent in the long term.

Because neither Zook Creek WSA nor Buffalo Creek WSA would be recommended as suitable for wilderness designation, coal with development potential within the WSAs would become available for further consideration pending application of the unsuitability and multiple use screens.

Summary

There would be significant impacts from coal mining and land actions, no impacts from vegetation utilization and insignificant impacts from wilderness actions.

Other Minerals

Three oil and gas fields, Liscom Creek, Pumpkin Creek, and Leary, extend into the acceptable coal area. The area of long-term impact covers about 7,900 acres. Short-term impacts are expected to be insignificant, since the affected areas lie outside current areas of coal industry interest.

Long-term impacts are unknown. The only other known mineral resources of note in the coal areas are clinker and sand and gravel. Because they are very abundant, conflicts with coal actions are expected to be insignificant.

There would be no impacts on other minerals from vegetation management actions.

Disposal or exchange of the surface estate over reserved oil and gas minerals would have the impacts of (1) reducing the BLM workload of checking reclamation from seismic exploration, and (2) complicating the permitting process for the lessee, since an additional participant (the surface owner) besides BLM would be involved. These impacts would not be significant.

There would be no impacts on claimed locatable minerals, since lands with mining claims recorded under Section 314 of FLPMA are prevented from being exchanged or sold. Disposal of the surface estate would prevent unclaimed locatable minerals from being claimed and recorded, pending regulations issued by the Secretary of the Interior. The resulting short and long-term impacts would not affect BLM, since the federal government receives no royalties from locatable minerals, but impacts would occur to private mining parties who lose access to potential mineral resources. Some of the 164,723 surface acres proposed for sale or exchange would be significantly affected, especially in the Alzada area.

Disposal of the surface estate would not affect BLM ownership of underlying mineral materials. A 1983 U.S. Supreme Court decision affirmed public ownership of sand and gravel on lands where the surface only was patented. Mineral entry rights would be preserved.

There would be no impacts on the availability of Zook Creek and Buffalo Creek WSAs for oil, gas, or geothermal leasing, location of mining claims, or material sales, both areas would be recommended as nonsuitable for wilderness designation.

Summary

There would be insignificant impacts from coal actions, no impacts from vegetation management or wilderness actions and significant impacts from land actions in localized areas.

Range

If all the areas were mined, there would be an approximate loss of 217,700 AUMs during mining on public and private surface. The most serious effect on vegetation after reclamation would be the irretrievably and irreversible loss of the natural vegetative mosaic and species diversity on all 1,277,067 acres. However, vegetation production may be better after mining due to extensive reclamation work. A total of 125,000 acres identified as needing range improvements overlap with areas acceptable for further coal leasing consideration. When public surface is delineated within a tract for possible coal leasing, as well as within existing coal leases, no additional range improvements would be proposed.

Current vegetation utilization for livestock of 208,083 AUMs would continue in the short term (five years) and increase by 53% to 319,269 AUMs in the long term (15 years) through range improvements on the 876,614 acres of selected good, fair, and poor condition rangeland. Range condition would be expected to improve by 25%. This increase in AUMs is based on soil productivity potential.

The overall effect of the proper application of mechanical treatments on 518,549 acres over the long term would be an improvement of range condition and a 100% increase in vegetation production.

Development of structural range improvements would reduce available forage by 7,231 AUMs during construction, but would increase the overall range condition on those acres that are selected for range improvements.

The 246 potential activity plans on 781,388 acres, when implemented, would have an increase in plant vigor, and species diversity. There would be a 25% increase in range condition and a 53% increase in AUMs.

The 12 functional AMPs would have no new impacts on vegetation production.

As the 15 nonfunctional AMPs become more functional, there would be an increase in plant vigor and species diversity. There would be a 15% increase in range condition and a 12% increase in AUMs due to possible changing of grazing systems. However, because of the relatively small number of acres, totaling 24,426, there would be an insignificant increase in range condition.

The wildlife projects that would be constructed would have no impact on vegetation production.

Improved management, range improvement placement and use supervision would result in improvement of 5,000 acres of riparian areas to a healthy woody riparian condition, having all age classes of trees represented with 30% or more of the stand being sapling or younger. Reduced use of riparian zones as forage areas and shade sources for livestock would result in an increase in cover and plant community structure and health.

Control of 40 acres of prairie dog towns would have an immediate effect of improving vegetative production and range condition. Production would increase 100%, because of improved plant vigor and the transition of the plant community from low to high producing species. Increased vegetation, shade and litter would increase site moisture retention and improve plant growth conditions.

Control of 130 acres of noxious weeds would result in up to a 200% increase in range condition through increases in desirable plant species, useful vegetation production and improved soil protection.

The short-term effect of prescribed burning on 20 acres and 500 acres burned from wildfires would be a loss of all forage being produced on the site. The long-term effect depending on the range site, would be a 50 to 70% increase in livestock forage through recovery of more desirable plant species.

Vegetation Utilization—Livestock

Current short-term utilizations would not affect livestock. Long-term increased use levels of 111,186 AUMs would provide feed for an additional 18,531 adult cattle for a six-month grazing season.

Livestock stress, due to moving livestock between pastures, would increase slightly on potential activity plans if implemented. Reliable spring livestock forage and cover for young calves would be provided in grazing systems. Livestock breeding success would be improved by fencing, which would create closer stock confinement. Changes in grazing management practices on allotments without activity plans would be minor and have little impact on stock.

As "C" allotments would generally not be improved, current utilization would not affect livestock.

Livestock production would increase and grazing distribution would improve because of land treatments and range improvements.

There would be no significant impact to livestock.

There would be a short-term loss of 7,024 AUMs and a long-term loss of 24,709 AUMs from land sales. The sale of these tracts would result in reduced grazing administration costs.

There would be a short-term loss of 2,358 AUMs and a long-term loss of 8,237 AUMs from land exchanges. The loss of AUMs could be offset by similar or a greater amount of vegetation production in lands gained from exchanges. Exchanges which consolidate tracts of public lands would result in more efficient grazing administration.

Lands disposal through R&PP actions would have no significant impact on the range resource.

Because Zook Creek would be recommended as nonsuitable for wilderness designation, there would be no impact on the range resource in the short term. In the long term, 7,929 acres in Zook Creek would be upgraded to excellent condition by range improvements. There would be an increase of 1,221 AUMs for livestock and 3,663 AUMs for wildlife and other nonconsumptive uses.

Because Buffalo Creek would be recommended as nonsuitable for wilderness designation, there would be no impact on the range resource in the short term. In the long term, 4,972 acres in Buffalo Creek would be upgraded to excellent condition by range improvements. There would be an increase of 572 AUMs for livestock and 1,716 AUMs for wildlife and other nonconsumptive uses.

Summary

There would be a significant cumulative impact on vegetation from coal mining, land sales and vegetation utilization actions. Impacts on vegetation from land exchanges and wilderness action would be insignificant. Under this alternative 95% of the rangeland would be in good or better condition after improvement.

Hydrology

Coal—Surface Water

Impacts to surface water quantity from coal mining are expected to be insignificant during mining and reclamation. Streamflow downstream of the mine sites would be retarded and possibly reduced by sedimentation ponds on the mine site. The overall effects would be to reduce flood peaks and slightly reduce stream flow. Surface runoff and associated peak flows would probably increase by approximately five percent, due to the decreased infiltration capacity of spoils immediately following reclamation (Arnold and Dollhopf 1977). Dollhopf (1979) predicts that the infiltration will improve as root systems develop and become similar to native rangeland. It is estimated to take 10 to 15 years to regain prior infiltration capacity. The net long-term effect of mining on surface water quantity would be insignificant.

Impacts to surface water quality are also generally expected to be insignificant during mining and reclamation. State regulations limit amounts of suspended solids, iron, manganese, and acidity in waters discharged from mined land. Monitoring is required to assure compliance. Impacts could be significant in isolated areas where groundwater from a mining area is the major contributor to the surface water drainage. In such areas, water would probably remain suitable for stock use, but not for agriculture. During mining, increased sediment loading from disturbed areas would be trapped by sedimentation ponds. After mining, sediment and water yields would be reduced by 626 ac ft/yr and 29,974 ac ft/yr, respectively, assuming reclamation and revegetation are successful (Table 4-18).

After reclamation, groundwater discharging from mined areas and carrying an increased salt load from leaching would add significantly to the salinity of nearby springs, seeps, and intermittent streams. The degree of increase depends on the geology of the area, but general increases of 500 to 2,000 mg/1 TDS can be expected (MDSL and OSM 1983). Rahn (1976) found these increases typically were sulfates, calcium, magnesium and bicarbonates. Van Voast et al (1978) speculates that most materials available for dissolution in the reclaimed spoils would be flushed with the first pore volume of water. However, in dry climates, such as found in eastern Montana, this process may take hundreds to thousands of years. In a practical sense, the impacts would be cumulative from all mined areas where salts were not flushed. Van Voast and Thompson (1982) have shown that no single mine can cause significant impacts to the Tongue River's quality or rate of flow. It is the cumulative effects from several mines which have the greatest chance of impacting a region's water resource. Estimates made by Van Voast for cumulative effects caused by nine active or proposed mines in the vicinity of Decker, Montana, show that post-mine groundwater reaching the Tongue River would increase its median dissolved solids content from 480 mg/1 to 510 mg/1.

A USGS modeling study (Woods 1981) predicts that Tongue River salinity would increase four to five percent following strip mining of 120,000 acres of federal land in southeastern Montana. This is less than one-tenth the increase caused by withdrawal and return flow of irrigation water. These results indicate that long-term regional effects from cumulative mines would not be significant in the Tongue River, but could be significant in smaller streams where groundwater from mined areas contributes a larger percentage of total surface water flow.

TABLE 4-18
SUMMARY OF WATERSHED IMPACTS
ALTERNATIVE C

	Sediment Yield (ac ft/yr)		Water Yield (ac ft/yr)		Surface Water Quality	Groundwater Quality
Impacting Element	Initial	Long Term	Initial	Long Term	Long Term	Long Term
Grazing Treatments	977	34	33,652	10,071	+	0
Mechanical Land Treatments	1,416	I	48,762	I	+	0
Fences	17	35	589	1,040	—	0
Water Developments (wells, springs, res.)	I	I	I	I	0	0
Fire	1	I	43	I	+	0
Chemical Treatments						
Noxious weeds	10	5	311	183	+	0
Prairie dogs	3	2	96	56	+	0
Riparian Areas	14	1	468	137	+	0
Coal Mining	1,874	1,248	94,655	64,681	—	—
Zook Creek WSA	10	7	494	338	—	—
Buffalo Creek WSA	8	5	388	265	—	—
TOTAL	4,330	1,337	179,458	76,771	—	—

I — insignificant
+ — increase
0 — no change
— — decrease

SOURCE: Omang, Parrett and Hull 1983, BLM 1983 and Appendix I

Coal—Groundwater

During mining, impacts to the local groundwater would be significant. Aquifers in the overburden and coal would be disrupted. Springs, seeps, and shallow wells in the immediate mine area would dry up or experience lowered water levels. Drawdown in wells caused by mining has been observed to extend from less than one-half mile to three miles (Hardaway and Kimball 1979; Van Voast et al 1978; Dollhopf et al 1978). The influence would vary with the direction of groundwater flow and would be typically greater in the down gradient direction (Van Voast et al 1977). After reclamation, impacts would be mitigated as the coal seam and overburden aquifers are replaced by a spoil aquifer. Depth and flow of groundwater in spoils would not differ greatly from conditions in undisturbed coal aquifers, but it may take several years for water levels to recover (Van Voast et al 1978).

According to Hardaway and Kimball (1978), a variety of professionals indicate that impacts are not significant on groundwater quality during mining. A mine acts as a sink for groundwater and precludes any possible flow of contaminants into the groundwater system. Water intercepted during mining is pumped into holding ponds and discharged only in accordance with state regulations. Seepage from holding ponds has impacted downstream areas in isolated cases. Impacts can be mitigated by diligent pond construction methods.

In reclamation, overburden is used to refill the pits, thus exposing new surface to invading groundwater. These new surfaces contain significant quantities of leachable salts and minerals that readily dissolve. Thus, groundwater in mined areas shows increases in dissolved solids. The spread of pollutants from reclaimed areas is difficult to predict. Van Voast (1980) and Ahern and Frazier (1981) state the areal extent is modified by sorption, chemical precipitation, and dilution and may be limited to a few hundred yards from pit boundaries. Other studies (Rahn 1976 and Moran et al 1976) suggest this spread may extend several miles downgradient from pit boundaries.

Coal—Hydrology Summary

Present and anticipated levels of coal mining indicate that regional impacts to surface and groundwater resources from coal mining would be insignificant. However, in localized areas, there would be significant impacts to groundwater quantity during mining and reclamation. These impacts would not be irreversible or irretrievable. Significant impacts to groundwater quality in localized areas would occur and would be both irretrievable and irreversible.

In the worst case situation, groundwater quality degradation would occur and persist for hundreds to thousands of years.

Vegetation Utilization—Hydrology

Construction of range improvements such as fences would result in increased sediment and water yields of 18 ac ft/yr and 451 ac ft/yr, respectively. The increase would be caused largely by livestock trailing along new fences.

Development of reservoirs and pits would temporarily disturb soil. Nearly all soil disturbance would be upstream of dams and would not contribute sediment below the dams. Development of springs and wells would disturb an insignificant amount of soil and would not impact sediment or water yields.

Mechanically treated areas would be exposed initially to wind and water erosion. However, infiltration would be improved, leading to increased soil moisture and vegetative cover (Wight and Sidoway 1972; Ryerson et al 1980; Saulman 1973; Neff and Wight 1977; Neff 1980). Sediment and water yields would be reduced by 1,416 ac ft/yr and 48,762 ac ft/yr, respectively. Mechanical treatment would not occur if holders of downstream water rights would be adversely affected.

Continued development and revisions of utilization management plans would slowly improve watershed condition. Sediment and water yields would consequently be reduced slightly in the long term by 943 ac ft/yr and 23,581 ac ft/yr, respectively.

Special management considerations for approximately 5,000 acres of riparian areas would result in less streambank erosion and improved water quality (Holechek 1980). Sediment and water yields would be reduced slightly in the long term by 113 ac ft/yr and 331 ac ft/yr, respectively.

Control of 40 acres of prairie dog towns and rehabilitation of the town sites would have an insignificant impact to water resources in the short term. In the long term, the cumulative impact would be to reduce sediment and water yields by one ac ft/yr and 40 ac ft/yr, respectively, a very slight reduction.

High concentration of noxious weeds force livestock to graze noninfested areas. Consequent reductions in vegetative cover would increase sediment and water yields (Noble et al 1979). Treatment of 130 acres of noxious weeds would result in reductions of sediment and water yields of five ac ft/yr and 128 ac ft/yr, respectively.

Acres burned by either prescribed burns or wildfires would expose bare ground to water erosion. Sediment and water yields would increase very slightly in the short term by one ac ft/yr and 43 ac ft/yr, respectively. Natural revegetation of burned areas in the long term would return sediment and water yields to pre-burn conditions.

Lands—Hydrology

No significant impacts to water resources would result from land sales or exchanges.

Wilderness—Hydrology

Zook Creek and Buffalo Creek WSAs would be recommended as nonsuitable for wilderness designation and would be available to coal mining. If mind, sediment yields would decrease by six ac ft/yr and water yields would decrease by 279 ac ft/yr, assuming reclamation and revegetation techniques were successful. There would be no irretrievable or irreversible losses to surface water quantity or quality in either the short or long term, but these impacts would not be irretrievable nor irreversible. There would be significant impacts to groundwater quality in both the short and long term. These impacts would be irretrievable and irreversible.

Summary

Cumulative sediment and water yields would be reduced by 2,998 ac ft/yr and 102,912 ac ft/yr, respectively, a moderately significant reduction. Significant losses in groundwater quantity and quality would occur in localized areas near mine sites. Groundwater quality degradation could occur on a regional basis and persist for hundreds to thousands of years. Mechanical treatments would significantly reduce sediment and water yields. Other vegetative, lands, and wilderness actions would have no significant impacts on water resources.

In the worst case situation, regional groundwater quality degradation would occur and persist for hundreds to thousands of years.

Soils

Impacts to soils during coal mining would involve significant increases in erosion and runoff on all 1,088,291 acres. Losses from wind and water erosion would be 47,600 acre feet of soil over the entire area disturbed. Reclamation potential is questionable on 130,000 acres that are in land capability Classes VII and VIII because of topography, depth to bedrock, rock outcrops and steepness of slope.

Direct impacts to the soil from mining disturbances would alter the soil structure and porosity. This alteration would affect permeability, infiltration rates, soil-air and soil-water relationships and bulk density. The natural fertility would be reduced by disruption of the nutrient cycle and a decrease in the organic matter content.

Proper replacement of subsoil and topsoil is critical for successful reclamation. Salt migration to the surface after profile reconstruction is possible, increasing the sodium content of the topsoil from its original level. This could decrease plant production and lower reclamation success. If oayers of toxic soil material and restrictive layers are replaced lower in the profile than where they were originally found, plant production may be better after reclamation.

With proper mitigation, there would be no impacts to the soils resource after reclamation.

This alternative would improve 1,026,182 acres of watershed to excellent condition in the long term through better distribution of livestock and water sources, and implementation of land treatments.

Management of livestock would redistribute grazing away from critical areas such as floodplains, riparian areas and around reservoirs, where possible. These areas are subject to trampling and compaction, which reduce vegetation and increase runoff and erosion.

In addition, construction of 1,035 range improvements would distribute the livestock to utilize upland areas and allow watershed conditions to stabilize.

Approximately 518,549 acres in the "M" and "I" categories have the potential to be mechanically treated, which would cause a loss of 726 acre feet of soil from wind erosion.

Wind erosion would cause 52 acre feet of soil loss from the construction of 760 reservoirs, pits and pipelines and three acre feet of soil loss from livestock trampling along 300 miles of new fence lines.

Prairie dog control on 40 acres would increase vegetative cover 100% in the long term and reduce runoff and erosion.

Noxious weed control on 130 acres would initially kill vegetation, leaving dead plant residue that would help control wind and water erosion. In the long term, the treated areas would have a 200% increase in range condition through an increase of desirable plant species, minimizing erosion hazards.

Prescribed burning on 20 acres and 500 acres burned from wildfires would remove most vegetation, leaving only plant residue in the short term. This would increase the available plant nutrients in the soil, but also would cause accelerated erosion and the loss of organic matter. In the long term, there would be a 50 to 70% increase of vegetation over the current production level, which would minimize erosion hazards and offset the short-term soil losses.

See Table 4-18 for sediment yields from water erosion by range improvements.

In the short term, there would be a loss of 780 acre feet of soil through wind erosion from project construction. In the long term there would be no significant loss of soil.

The sale of 123,542 acres would not impact the soils resource except where there may be a change in land use. The type of change made, i.e., agriculture and road or building construction, would determine the amount of erosion. This is expected to be an insignificant loss.

The exchange of 41,181 acres would not impact the soils resource if there is not a change of use, since an equal value of lands would be received.

The disposal of lands through an R&PP action would have an insignificant impact on the soils resource if a land use change were to occur.

There would be no significant impacts to the soils resource in the Zook Creek WSA.

Short-term impacts to the soil from coal mining in Zook Creek would involve significant increases in erosion and runoff on 4,000 acres. Losses from wind and water erosion would be 175 acre feet of soil over the entire area disturbed. Reclamation potential is questionable on 2,640 acres that are in land capability Class VII, because of topography, depth to bedrock, rock outcrops and steepness of slope. Direct impacts to the soils from mining disturbances would be the same as described in the section on soil impacts from coal mining with proper mitigation, there would be no impacts to the soils resource after reclamation.

There would be no significant impacts to the soils resource in the Buffalo Creek WSA.

Short-term impacts to the soil from coal mining in Buffalo Creek WSA would involve significant increases in erosion and runoff on 5,650 acres. Losses from wind and water erosion woud be 247 acre feet of soil over the entire area disturbed. Reclamation potential is questionable on 229 acres that are in land capability Classes VII and VIII, because of topography, depth to bedrock, rock outcrops and steepness of slope. Direct impacts to the soil from mining disturbances would be the same as described in the section on soil impacts from coal mining. With proper mitigation, there would be no impacts to the soils resource after reclamation.

The potential to implement mechanical treatments on 1,783 acres in Buffalo Creek would cause losses of 75 acre feet of soil to wind erosion. This is a short-term loss of soil, and would be insignificant in the long term.

Summary

The cumulative loss of soil from coal mining and vegetation utilization actions would be 48,802 acre feet (48,022 and 780 acre feet, respectively). The losses from these actions would be insignificant with proper mitigation. Impacts from land and wilderness actions would be insignificant.

Wildlife

Coal development on all 1,088,291 acres would result in significant local impacts to wildlife, even if mitigation for the loss of wildlife habitat were successful. Wildlife habitat mitigation required under state and federal regulations would limit most impacts to the mining and reclamation phase. As mining occurs, wildlife habitat would be destroyed; that would be a significant impact. Each of the 22 current federal coal leases identifies wildlife concerns where they occur within each lease.

BLM coal planning prior to 1982 identified 1,619 acres of sharp-tailed grouse, sage grouse and antelope habitat for which mitigation would be required. The 1982 MFP Amendment identified 3,004 additional acres of critical wildlife habitat for which mitigation would be required. This includes sharp-tailed and sage grouse leks and sage grouse and antelope wintering areas.

In addition to these impacts, the following habitats would be impacted:

(1) In the vicinity of Decker and in the uplands west of the Tongue River Reservoir, 16,000 acres of mule deer and antelope winter ranges, sharp-tailed and sage grouse leks, sage grouse wintering areas, prime turkey, antelope and mule deer habitats;

(2) In the bottoms and breaks along the Tongue River and its tributaries from the Rosebud-Custer County line to the Wyoming border, 40,500 acres of grouse leks, prime mule deer, turkey and white-tail habitats in riparian areas;

(3) In the headwaters of the Hanging Woman and Otter Creek drainages, 28,000 acres of sharp-tailed and sage grouse leks, prime antelope and mule deer habitats;

(4) In the Powder River breaks and bottoms from Broadus to Moorhead, 291,000 acres of prime mule deer, turkey, and antelope habitats, grouse leks and prime whitetail habitat in riparian areas;

(5) In Rosebud and Big Horn Counties, north of the Northern Cheyenne Indian Reservation, 3,400 acres of grouse leks, prime mule deer and antelope habitats;

(6) In the Pine Hills, east of Miles City, 480 acres of sharp-tailed grouse leks;

(7) In the Pumpkin, Mizpah and Foster Creek drainages, 14,600 acres of grouse leks, prime antelope, mule deer, turkey and white-tail deer habitats in riparian areas;

(8) In the Graveyard, Sweeney and Rosebud Creek drainages, 1,400 acres of sharp-tailed grouse leks, prime antelope and mule deer habitats.

These figures are best estimates, because of the large acreage pending further study. Critical wildlife habitat will be given consideration in the application of the unsuitability criteria to these areas.

Total restoration of some habitat types such as 225,000 acres of steep breaks and woody draws, has not been fully demonstrated. Areas that are reclaimed would have the potential to produce high quality spring and summer habitat.

During mining, development and increased harassment would cause movement of wildlife species to less disturbed habitats. Increased human activity would result in increased poaching. These impacts would be significant during the mining and reclamation phase. Species distribution would return to a more natural state with the completion of reclamation. Because it has not been shown that all types of wildlife habitat can be successfully reclaimed and because of the large amount of acreage involved, impacts to wildlife would be significant even after reclamation activities.

Although no major fisheries would be directly impacted, the watersheds in the potential mining areas do influence water quality of Yellowstone River tributaries. Each of these is important to the local sport fishery, and impacts caused by mining could be significant. Mitigation during and after mining should target potential siltation and water quality and flow problems.

All known threatened and endangered species use areas were eliminated from further lease consideration in the application of unsuitability criteria, where inventory was complete. After application of the unsuitability criteria to the areas pending further study, all known threatened and endangered species use areas will have been eliminated from further consideration. Increased development and human activity would result in increased disturbance of transient threatened and endangered species, including bald eagles and peregrine falcons, which may migrate through developed areas.

Any emergency leases or coal exchanges which may develop under this alternative must be considered on a case-by-case basis, to assure the protection of critical wildlife habitat.

Vegetation use of 624,249 AUMs in the short term and 957,798 AUMs in the long term for wildlife and nonconsumptive uses would have few favorable impacts on wildlife. Cumulatively, there would be a significant impact on wildlife. Although there would be an increase of vegetation on the land, the vegetation types and diversity critical to wildlife would be substantially reduced.

Mechanical treatments of up to 518,549 acres would have significant short- and long-term impacts on wildlife habitat because of the large amount of land involved.

Vegetation manipulation would alter the wildlife population density and diversity in the treated areas. All wildlife would be displaced temporarily. The expected 15% increase in succulent spring grass and forbs would benefit some species seasonally. However, decreased vegetative diversity would reduce the abundance and diversity of widlife species. Big sagebrush habitat, critical to antelope and sage grouse survival, would be evaluated on a case-by-case basis to protect that resource.

Wildlife concerns would be strictly secondary to livestock in any of the 246 potential activity plans. This would have severe local impacts because of habitat disturbance and destruction. Range improvements totaling 1,035 projects would displace wildlife temporarily on 1,206 acres, due to habitat disruption and increased human activity. Developed water sources would be beneficial to wildlife. They would help break up heavy concentrations of livestock at overused watering sites and would provide additional water sources for all forms of wildlife.

However, damage to important wildlife use areas such as woody draws would occur. Construction of 300 miles of fence would result in better distribution of livestock. Areas of concern are big game wintering and concentration sites, where wildlife movement would be restricted. Increased wildlife/livestock competition in areas to which livestock are redistributed would be a significant impact.

Fencing approximately 49 of the new water developments would benefit nesting birds by providing four to eight acres of residual vegetation for cover at each site.

The average annual installation of 20 bird ramps in stock tanks would be beneficial to all small wildlife species that use these water sources. The ramps help present the drowning of small animals. The continued construction and placement of an average of 20 bird nest boxes and 10 goose nesting platforms annually would benefit mainly waterfowl, kestrels and bluebirds. The average construction of one livestock exclosure around a new pond development would benefit waterfowl by providing undisturbed nesting cover. The continued stocking or restocking of game fish in two stockponds annually would benefit the general public by maintaining good fisheries. Reservoirs identified as suitable for recreational fishing would be fenced to provide and maintain a quality fishery. A tank, water gap or other means of livestock access to water would be provided.

Maintaining woody riparian reproduction in areas to provide 30% of the woody species as saplings or younger trees would assure continued age class diversity in the system. This would assure the availability of browse for use by wildlife through winter months.

Control of 40 acres of prairie dogs would further reduce the known prairie dog acreage by 1.5%. There is concern that as this natural habitat is further reduced, the prairie dog and associated species would reach dangerously low population levels, locally as well as regionally.

The treatment of 130 acres of noxious weeds, particularly Canada thistle, would reduce the available food for seed-eating birds. The small acreage treated would have minor impacts on wildlife.

Implementing prescribed burn plans on 20 acres annually and modified fire suppression plans would eliminate some dense vegetation. Although some wildlife species do require dense trees or shrubs, extensive areas of dense vegetation could be of greater value to wildlife if it were thinned with scattered openings.

Even though other wildlife species would not be considered, there would be no significant impacts on threatened or endangered species. Each range improvement project would be surveyed for the occurrence of threatened or endangered species; recommendations would be made for appropriate mitigation or project stipulations. Any control of prairie dogs would decrease the potential habitat for black-footed ferrets.

Disposal of 165,054 acres would mean the loss of BLM control on that wildlife habitat. The lands program also offers some potential for exchange of lands having equal or greater wildlife habitat values, which would benefit from public ownership. With over 15% of the public lands considered for disposal primarily through sales, there could be significant negative impacts on wildlife habitats if the lands were converted to other uses. Although wildlife concerns would receive little emphasis in sales decisions, threatened and endangered species would be given consideration and would be impacted in the least possible manner. Overall, the impacts from land actions would be highly significant.

Recommending Zook Creek WSA as nonsuitable for wilderness designation would allow the possible development of ORV use, range improvements, and post and pole cutting. In the short term, there would be significant impacts on sharp-tailed grouse leks, turkey winter habitat and critical mule deer range because of local disturbance. Because of the limited acreage involved, the long-term impacts would be insignificant, even with the addition of impacts from oil and gas development.

Opening 4,000 additional acres to coal development would have significant impacts on wildlife due to habitat destruction and disturbance during mining. Long-term impacts of coal development would also be significant, since the woody draws and steep breaks would not be reclaimed. Application of the coal unsuitability criteria would protect threatened and endangered species as well as species of special concern to state and federal agencies.

Recommending Buffalo Creek WSA as nonsuitable for wilderness designation would allow possible development of the oil and gas resources, ORV use, range improvements, and post and pole cutting. There would be localized, insignificant adverse impacts to nesting raptors.

Opening 5,650 acres to coal development would have significant impacts on nesting raptors, due to habitat destruction and disturbance during mining. The long-term impacts in this area would be insignificant, given prescribed mitigation neasures. Application of the coal unsuitability criteria would protect threatened and endangered species as well as species of special concern to state and federal agencies.

The identified environmental consequences on these two specific areas are based on extensive but incomplete inventory data; these site specific consequences cannot be extrapolated to the entire resource area where the habitat diversity is vastly greater.

Summary

The cumulative impacts on wildlife from coal, vegetation and land actions would be highly significant due to the destruction, disturbance and sale of wildlife habitat. There would be widespread disruption of natural habitats in southeastern Montana, which would be irreversible and irretrievable. Wilderness actions would have insignificant impacts on wildlife, except where coal would be developed.

Cultural Resources

Based on projections from inventoried lands, from 3,600 to 10,900 cultural sites would be affected if all coal areas considered are mined. Previous evaluations of cultural resources indicate that between 5% and 20% of these sites may be significant and eligible to the National Register of Historic Places. Impacts of coal mining would be minimal once prescribed mitigation in laws, regulations, and policies pertaining to cultural resource management were followed.

Improved range condition would generally benefit cultural resource sites by increasing ground cover and reducing erosion. However, some developments such as mechanical treatments and burning would destroy the context or structure of a site. Mitigation through existing policies, however, would minimize the impacts of ground-disturbing treatments on cultural resource values.

Lands identified for potential sale, exchange or other disposal action would be inventoried for prehistoric and historic sites. Through existing policies for mitigation, the effects on cultural resource values would be minimal.

There has been no intensive inventory of the cultural resources of either Zook Creek or Buffalo Creek WSA to suggest direct impacts. Sites which could exist in the areas would be subject to the impacts of continued multiple use management. Through existing policies for mitigation the effects on cultural resources would be minimal.

Summary

The impacts of all actions on cultural resources would be minimal

Paleontological Resources

Impacts on the paleontologic resource by coal mining would be minimal. Plant and mollusk fossils are commonly widespread throughout the mineable portions of the Fort Union and Wasatch formations. However, two significant vertebrate fossil localities are recorded in areas of coal with development potential. More undiscovered localities may exist.

There would be some insignificant effects on the paleontologic resources from vegetation utilization actions. Most fossil localities are in areas that do not lend themselves to mechanical treatments or range improvement. Some trampling of significant localities by livestock would occur. Avoidance or collection of paleontologic material when constructing range projects would occur on a case-by-case basis.

Approximately 19,000 acres or 12% of the 165,054 acres identified for disposal and 570 acres of 21% of the 2,760 acres identified for further study fall within the exposures of the Hell Creek formation. A potential loss within the Hell Creek formation would occur on 14,678 acres due to sales and 4,892 acres due to exchanges. There would be an overall loss of public management of paleontologic resources on a maximum of 19,570 acres in a "worst case" situation with (21% of the Hell Creek formation exposed on public land) no mitigation measures applied to the exchange areas.

There would be no impacts on the paleontologic resource from wilderness actions.

Wilderness

ZOOK CREEK WILDERNESS STUDY AREA

In the Zook Creek WSA, 4,000 acres containing 173 million tons of coal with development potential would be acceptable for further lease consideration. The remaining 4,438 acres containing 291 million tons would be deleted from further leasing consideration due to other unsuitability criteria. Within the short term, it is very unlikely that mining would occur in this area. No mine plans exist adjacent to the WSA. In the worst case, if all suitable coal were mined in the long term, impacts would be severe. All wilderness values within the WSA would be irreversibly and irretrievably lost, both in the 4,000 acres actually mined and in the 4,438 acres restricted from mining by unsuitability criteria.

Mining is possible within several miles of the WSA. Most likely, impacts would be insignificant. As a worst case (if all acceptable areas were mined), offsite activities would diminish the wilderness characteristics of naturalness and outstanding opportunities for solitude. This would be a significant indirect impact. There would be a possibility, in the long term, that oil and gas development on 8,438 acres would degrade the naturalness of the area. This would be a significant impact.

Management of vegetation in Zook Creek, including maintenance of range improvements and the surface treatment of 1,746 acres, would eliminate the wilderness characteristics of the WSA in the long term.

There would be no impacts on wilderness characteristics from range developments or surface treatments outside of the WSA.

There would be no impacts on wilderness characteristics from lands actions outside of the WSA, except if public access were gained through land exchanges.

The 25 visitor days of off-road vehicle use per year would continue and have an insignificant impact on the naturalness of the area.

There would be no impact to the wilderness resource due to forest management in the short term. There would be an insignificant impact on the wilderness characteristic of naturalness from incidental post and pole cutting in the long term.

Summary

Zook Creek would retain its wilderness characteristics in the short term. The naturalness characteristic would be degraded in the long term, due to the cumulative impact of range treatments and developments. Coal or oil and gas development, if it occurred, would also degrade the wilderness characteristic of naturalness.

The opportunity to expand the diversity of the National Wilderness Preservation System by designating an example of the Great Plains short grass prairie eastern ponderosa pine ecosystem would be foregone, as there are no such examples currently in the system.

BUFFALO CREEK WILDERNESS STUDY AREA

In the Buffalo Creek WSA, the area would be acceptable for further consideration for coal leasing pending further study. In the short term, coal leasing and mining of the area is unlikely and, therefore, no effects on the wilderness characteristics are expected. However, as a worst case, 55 million tons of 5,650 acres would be mined and the wilderness characteristics would be irreversibly and irretrievably lost.

Mining is possible within several miles of the WSA. Most likely, impacts would be insignificant. As a worst case (if all acceptable areas were mined), offsite activities would diminish the wilderness characteristics of naturalness and outstanding opportunities for solitude. This would be a significant indirect impact.

There would be a possibility in the long term that oil and gas development on 5,650 acres would degrade the naturalness of the area. This would be a significant impact.

Management of vegetation in Buffalo Creek, including maintenance of projects, the construction of two miles of fence and the surface treatment of 1,783 acres, would eliminate the wilderness characteristic of the WSA in the long term.

There would be no impacts on wilderness characteristics from range developments or surface treatments outside of the WSA.

There would be no impacts on wilderness characteristics from lands actions outside of the WSA, except if public access were gained through land exchanges.

The 150 visitor days of off-road vehicle use per year would continue and have an insignificant impact on the naturalness of the area.

There would be no impact to the wilderness resource due to forest management in the short term. There would be an insignificant impact on the wilderness characteristic of naturalness from incidental post and pole cutting in the long term.

Summary

Buffalo Creek would retain its wilderness characteristics in the short term. The naturalness characteristic would be degraded in the long term, due to the cumulative impact of range developments and treatments. Coal or oil and gas development, if it occurred, would also degrade the wilderness characteristic of naturalness.

The opportunity to expand the diversity of the National Wilderness Preservation System by designating an example of the Great Plains short grass prairie eastern ponderosa pine ecosystem would be foregone, as there are no such examples currently in the system.

Land

There would be no impacts on the lands resource resulting from coal mining, vegetation utilization or wilderness actions.

Sales of isolated, inaccessible tracts would result in an irretrievable loss of 123,542 acres from public ownership. Most of these lands are small, isolated tracts unusable by the public and unmanageable as part of the public land system.

Increased sales would reduce the opportunity to balance, acquire or preserve other land resources by exchange.

Exchanges of 41,181 acres would result in some increase in management efficiency and public use by consolidating isolated, inaccessible tracts, acquiring access to bodies of water and large tracts, and acquiring land or easements for preservation of cultural, historical, paleontological and recreation sites. This action would also reduce the administrative costs for maintaining these small, isolated tracts and retain a balance of natural resources.

Disposal under the R&PP Act would result in a significant beneficial use by the public.

Summary

There would be no impacts from coal mining, vegetation management and wilderness actions. There would be a minor benefit from land transactions.

Recreation

If all areas were mined, 61,000 acres near the Tongue and Powder Rivers having scenic value and 500 acres having local historical value (Battle Butte and the Battle of Hanging Woman Creek) would be irreversibly and irretrievably lost. Because of the loss of hunting opportunities on up to 1,088,291 acres during mining and reclamation, there would be additional hunting pressure on surrounding private and public lands. These would be significant impacts. However, after successful reclamation, the latter would be an insignificant impact. About 84.5% of all federal coal with development potential lies under private surface, and recreation use is governed by the surface owner. Additional limitations on the general public because of mining would be significant.

The 700 additional reservoirs and pits would improve hunting potential through the dispersion of wildlife and would increase the fishing resource. The 150 two-mile sections of fence would inconvenience hunters by restricting their movements. This would be an insignificant impact. Mechanical treatment of 518,549 acres would result in local short-term reductions in hunting habitat, which would be an insignificant impact in the long term.

Recreation, especially hunting and wildlife observation, would benefit from the woody riparian management techniques. The control of prairie dogs and noxious weeds and prescribed burning at these levels would result in no impacts.

The sale of 35,369 acres in the short term would result in an insignificant impact to recreational opportunities. These lands are generally isolated from the public due to the lack of access. However, the sale of 123,542 acres in the long term would result in a significant impact, reducing the recreational opportunities. The exchange of 11,789 acres in the short term and 41,181 acres in the long term would allow public land to be consolidated and access to be gained to isolated tracts and bodies of water. Also, exchanges would aid the Montana Department of Fish, Wildlife and Parks in meeting its objectives of gaining access to bodies of water, access to public land for hunting purposes and continued consolidation of public land at or near significant historical sites. Increased access to public lands and bodies of water would aid the BLM in meeting the long term demand for recreation. Therefore, exchanges would have significant beneficial impacts. Recreation would benefit from Recreation and Public Purpose actions. However, the resource would be managed by agencies other than the BLM.

Recommending Zook Creek or Buffalo Creek WSA as nonsuitable for wilderness designation would have no impacts on recreation. Current use is generally for hunting, which would continue. In the long term, recreational use would have the potential for expansion, with the continued opportunity of off-road vehicle use. The scenic values of these areas would be irreversibly and irretrievably lost due to coal mining. In relation to the surrounding area, this would be an insignificant impact.

Summary

The cumulative impacts of coal mining actions on recreational opportunities would be significant. The vegetative utilization and wilderness actions would have insignificant local short-term impacts. The sale of land would result in significant adverse impacts. There would be insignificant impacts from exchanges.

Air Quality

Concentrations of TSP would be elevated in the vicinity of any mining activity. Depending on the situation, average annual concentrations of TSP at the mine area boundary would range from 20 to 90 mg/m^3 and second highest 24-hour concentrations would range from 75 to 260 mg/m^3. These concentrations would fall back to one mg/m^3 above baseline levels at a distance of two to nine miles from the active mine area, in worst case situations (PEDCo SSAs 1983). Violations in the state 24-hour ambient air quality standard of 200 mg/m^3 due to cumulative emissions from adjacent mines would occur in some cases. More violations would occur because of the additional coal available and because the terrain of that additional acreage is rougher and more conducive to concentrating pollutants.

Increases in particulate and geseous pollutants would be a phenomenon that would be insignificant, except in the immediate vicinity of active mining. Successful land reclamation would eliminate degradation of air quality. Impacts resulting from the proposed action would be limited to degradation of air quality and insignificant climatological changes during mining and reclamation.

Increments of TSP are not consumed by mining under the PSD ruling, unless the mining occurs within a designated impact area of a major polluting source. There are no such impact areas for TSP in the Resource Area now, consequently no mining activity will consume TSP increments either in the Resource Area or in the Northern Cheyenne Indian Reservation Class I area. Mining could affect AQRV on the Class I area. The AQRV most likely to be affected by mining would be visibility. The visibility reduction modeled for the closest proposed coal tract to the Reservation was an imperceptible and insignificant 0.7 percent.

Fugitive dust generated by wind erosion on the moderate to severely susceptible soils has elevated TSP to an average background concentration of 15 mg/m^3; this would continue on a long-term basis. Land treatments increase surface exposure and raise fugitive dust concentrations to about 30 mg/m^3 over the short term, until vegetation is well established. Increased vegetative production would have a positive effect on reducing fugitive dust generation from wind erosion. There would be a 27.7% reduction in TSP for 14.8% of the land area, resulting in a concentration for those lands of about 12 mg/m^3.

Meteorological conditions, such as inversions, sometimes permit high concentrations of particulate matter to accumulate in localized areas. However, they are small in scale and quickly dispersed. In the long term, land treatments would enhance air quality by reducing TSP concentrations to about 10 mg/m^3 for range in excellent condition. Chemical control of noxious weeds could produce very localized, short-term, virtually unmeasurable impacts to air quality by drifting in and around the treatment areas. Prescribed burning would elevate the concentration of airborne particulate matter in localized areas over the short term. Concentrations of particulates eight hours after the burn would be on the order of 500 mg/m^3 and this would be reduced to 20 mg/m^3 above background within 24 hours of the burn. Impacts from all the described activities are considered insignificant in that they rarely, if ever, result in the violation of standards. Certainly no irreversible commitment of the air resource is posed by these land management practices.

Lands involved in sales or exchanges could be farmed once they come under private ownership. These actions would contribute minimally to air quality impacts currently being experienced. Otherwise, there would be no impacts on air quality as a result of lands actions.

Fugitive dust, generated by wind erosion on moderate to severely susceptible soils, would not deteriorate air quality from present levels at Zook Creek and Buffalo Creek WSAs. Degradation of air quality in the long term from any energy development would be limited to acceptable levels by state and federal standards and would not threaten the current air quality in the WSAs.

Summary

Coal mining actions could affect AQRV on the Cheyenne Indian Reservation, a Class I area. The AQRV most likely to be affected would be visibility. Cumulative emissions from adjacent mines could violate state 24-hour ambient air quality standards on occasion. Impacts from any vegetation utilization actions would be insignificant in the short term and beneficial in the long term. No impacts to air quality would be experienced from lands actions, except where lands are developed for farming. Wilderness actions would have insignificant impacts on air quality.

Forestry

Approximately 70,360 acres of commercial and noncommercial (woodland) forest land on public surface would be irreversibly and irretrievably lost if all areas were mined, assuming that there continues to be no proven reclamation techniques that can successfully reestablish ponderosa pine forests on previously mined land. This figure is 52% of the total of BLM administered forest land and represents nine percent of the total federal and Indian forest lands in the Resource Area.

Since the Resource Area has no established allowable cut, the loss of public forest land would not impact the Bureau's forestry program during mining and reclamation or after reclamation. However, the amount of Bureau forest resources available for incidental sales of firewood, Christmas trees, sawlogs, and posts and poles would be significantly reduced. In addition, the loss of forest cover would significantly affect other Bureau programs, especially wildlife and recreation.

Approximately 104,620 acres of forest on private surface over federal coal would be lost if all areas were mined. The impacts due to the loss of private forest land would be essentially the same as the loss of public forest land. The cumulative impacts from the combined loss of public and private forest lands would be insignificant to the forest products industry.

There would be no impacts to the forest resource from any of the vegetative utilization actions.

A maximum of 17,686 acres of commercial and noncommercial (woodland) forest land would be removed from public ownership, because of sales or exchanges where no similar land is acquired. Sales would be emphasized over exchanges; therefore, it is likely that the above figure would reflect the loss of forest acreage from public ownership. This figure is 13% of the forest land administered by the BLM and represents two percent of the total federal and Indian forest lands.

In the event that the maximum amount of forest land (17,686 acres) is removed from public ownership, the Bureau's forestry program would not be impacted in the short or long term, since the Resource Area does not have an established allowable cut. However, the amount of forest resource available for incidental sales of firewood, Christmas trees, sawlogs, and posts and poles would be reduced, perhaps significantly in some areas.

There would be a minor positive impact to forest development in the long term, since the wilderness study areas would be open to a wider range of forestry management options, including post and pole sales.

Summary

Cumulative impacts on the forest products industry would be insignificant, because the impacted forests are not of high quality and are not in demand. However, a significant amount of public and private forest lands would be irreversibly and irretrievably lost due to coal mining. A lesser amount of public forest land would be made unavailable due to land actions. There would be no impacts from vegetation utilization or wilderness actions.

Agriculture

If all areas were mined, 50,216 acres currently utilized as cropland would be affected. Maximum annual loss during mining and reclamation would be 1,345,789 bushels of winter wheat or 70,302 tons of alfalfa hay. These losses would not have a significant effect on regional agricultural production; however, individual operators could be significantly impacted.

Annual soil disturbance from mining (600 to 1,000 acres) at current and projected rates of production would not exceed that acreage presently left bare annually due to summer fallow (2,000 to 2,500 acres) in the areas of coal with development potential. Preliminary indications from completed and ongoing reclamation research are that after reclamation, impacts would not be significant, since agricultural productivity of mined land can be restored. (Gilley et al 1982, Pole et al 1979, Power et al 1981).

Vegetative utilization actions would have no impact on agriculture.

Sale or exchange of 164,723 acres could include some or all of the 637 acres of public land currently utilized as cropland and tame pasture. There are 14,619 acres in the short term and 51,064 acres in the long term that have potential to be plowed and are in capability Class III and IV.

There would be no impacts from wilderness actions, because there is no agricultural use in the WSA.

Summary

The cumulative impact on regional agriculture would be insignificant. However, coal mining actions could have a significant impact on some individual operators. Land actions could have a beneficial impact on some individual operators. There would be no impacts from vegetation utilization or wilderness action.

Economics

This alternative also identifies additional coal that has not been identified in previous planning. Impacts from developing any of this additional coal would add to the impacts identified in previous planning. See Tables 4-8 through 4-16.

Since there have been no expressions of interest submitted by industry and tracts have not been delineated, it is not possible to identify where and when this coal would be leased and mined.

After a potential mine area has been identified by industry, tract profiles, a regional EIS and permit EISs must be written. These would provide community leaders and planners with more accurate information to properly plan for impacts.

Coal is available for further consideration for leasing in the areas north, south and east of the Northern Cheyenne Reservation. (See Alternative C Map in map folder).

The impacts from mining additional coal that have not been identified in previous planning would affect each of these areas differently.

If additional coal is mined north of the Northern Cheyenne Reservation, the communities of Hardin, Forsyth and Colstrip would be most heavily impacted. The past experiences of these communities in accommodating coal development would help to minimize these impacts. These communities have much of the necessary infrastructure and primary services in place. Other additional services could be expanded at reasonable costs to support additional growth.

Additional coal development in the area south of the reservation would most heavily impact Birney, Decker and Sheridan, Wyoming. This area in Montana is sparcely populated and as in the past, miners would most likely reside in Sheridan, Wyoming with little expected growth to Birney or Decker. Sheridan also has much of the infrastructure and primary services available to support additional growth. Sheridan may be required to go to the Wyoming Legislature for additional funding to support further growth.

The area east of the reservation would have the most difficulty with coping with impacts from additional mining. The communities of Ashland and Broadus in Powder River County to date have not experienced rapid growth from coal development. By the time that the additional coal identified in this document reaches the leasing stage, these communities could be experiencing growth due to development of mines resulting from the 1982 and 1984 Federal coal lease sales and the development of the proposed MONTCO mine.

These communities have not had the experience that communities identified in the north and south sectors have had with coal development. The 1980 population of the communities, Broadus (715), Ashland (approximately 400), are small in comparison to the other impacted communities. Due to their small size, impacts would be relatively greater. These communities also would need to establish lines of communication with State agencies and the Montana Coal Board as have the other impacted communities.

Powder River County does not have an established tax base from coal development as do Rosebud, and Big Horn Counties. Consequently, this county may have severe problems supporting this additional impact during the early years of development until tax revenue starts coming in from coal production.

Additional coal development on or near the Northern Cheyenne or Crow Reservations will impact the reservations both positively and negatively. Additional mines may provide additional job opportunities for the Northern Cheyenne and Crow Indians but at the same time will bring more people into the area causing additional disruption to the lifestyle and fiscal requirements of the Indians. The community of Lame Deer would probably receive the greatest impact.

Figures are provided in Table 4-2 for use by community leaders and planners to determine impacts for each additional million tons of coal proposed to be mined. These figures are then used to compute the requirements for a five million ton per year mine in Table 4-3.

The states share of federal royalties, the state severance tax and the increased county tax valuation are portrayed in Table 4-4. The increased tax valuation only applies to the county and school district where the coal is mined. Plant and equipment is estimated at $5,000,000 per million tons mined. The increased valuation would be taxed at the county mill levy and the school district mill levy. Although this increase would help to meet expenditures, there is a one to two-year delay from the time of the initial impact to the time of the collection of additional taxes.

The State Severance Tax Impact Fund provides the Montana Coal Board with money to assist impacted areas. This is currently 8.75% of the severance tax collected on each ton mined. In our example of a five million ton mine at $7.83 per ton (1980 data—Powder River II Coal EIS), the 30% severance tax would provide $11,745,000 of increased revenue per year. Of this amount, over $1 million is available to the Coal Board. Impacted entities must apply to the Coal Board for this money. Indian reservations and communities can also apply to the Coal Board for impact funds. They must compete with state agencies for this money, which totals seven percent of 8.75%. A five million ton mine would provide an additional $71,938 per year.

In FY 1984, the Office of Budget and Planning for the State of Montana estimates that severance taxes will provide $98,654,000. The impact fund for the Coal Board totals $8,632,000. The seven percent share of this fund for Indian tribes and state agencies amounts to $604,240. These annual figures would increase as production and/or the price of coal increases.

This alternative would improve 876,614 acres to excellent condition. This would enable BLM to increase forage use for livestock to 319,269 AUMs, an increase of 111,186 AUMs in the long term. In addition, wildlife, watershed protection and other noncomsumptive uses would increase 333,539 AUMs. The cost would be approximately $18,043,680, or an average cost of $14.13 per AUM.

These improvements would allow ranchers to utilize 9,265 additional AUMs. Estimating the value at $400 per AU, this would add $3,706,000 to the economy from cattle each year.

Preference values would increase by $11,118,600, providing for greater loan value to ranchers, and increasing the value of ranches, if sold.

Assuming that federal lands sold would average $100 per acre, based on recent sales, some $3,536,850 would be received for the U.S. Treasury in the short term and $12,379,050 in the long term by sale of 75% of these lands.

There would be a decrease in BLM management costs due to the deletion of isolated tracts.

Counties would realize a lesser than current amount from the federal government in the form of payments in lieu of taxes (PILT). However, by placing these lands on the tax rolls, this loss would be offset by tax payments.

Economic production from these lands is not expected to change as only ownership of the land is tranferred.

There would be no economic impact from recommending Zook Creek or Buffalo Creek as nonsuitable for wilderness designation.

Social Impacts

If the coal market were to improve and much of the coal cleared for further lease consideration were eventually developed, the region's economic base could change greatly. Coal development would dominate the agriculture would pay a reduced role. Rural communities would lose their close-knit face-to-face informal social interaction and this would be replaced with more formal mechanisms of integration. Agricultural customs and culture could be replaced by more urban forms. Newcomers from the coal industry could fill many political seats once occupied by ranchers.

If much of the coal acreage considered acceptable for further study were developed, there would be significant social impacts in Powder River, Big Horn and Rosebud Counties. There would be significant impacts to Broadus, the Ashland-Otter Creek-Birney area, Forsyth, Colstrip, Hardin and Sheridan, due to the magnitude of population increase.

The development of coal within commuting distance of the Northern Cheyenne and Crow Reservations could help solve an important social problem of both tribes, unemployment. However, there would be trade-offs involved. A large population influx of non-Indians, on and off the reservation, could substantially increase the Native American cross-cultural contact, increasing cultural disintegration.

The general social well-being of ranchers who lease BLM land for grazing would be improved with an increase of AUMs and improved range condition.

Depending upon the situation, there is a potential for both increasing and lowering the social well being of certain ranchers who use BLM land for grazing if lands are sold or exchanged. There is the potential for increasing the operator's social well-being if he gains the BLM land through sale or exchange. This would increase the operator's control over land he may have used for years. Another positive social benefit would be to local governments and communities that would accrue more revenue from taxes for these isolated tracts.

Sale as a method of land disposal may have more potential for negative impacts. If land adjacent to current operators is sold, even under modified bidding procedures, the operator may not be able to afford to purchase the land. BLM land sales would have more potential for negatively impacting the small rancher or those with heavy debt loads, than the larger, wealthier ranchers.

Exchanges as a land disposal practice may have less likelihood of inequitable impacts. There is still the possibility that if land adjacent to current operators is exchanged to someone else, it may harm the operator's ranching operation. Three-way trades or land exchange pooling may somewhat mitigate this possibility. If exchanges are used to improve access to public land, regional recreational and hunting opportunities would be enhanced.

There would be minimal social impacts resulting from wilderness actions.

Coal

A maximum of 3.43 billion tons of federal coal with development potential, plus any additional coal mined as a result of emergency leases, would be irretrievably and irreversibly lost by mining. It is anticipated that the demand for coal in the next ten years would be less that 15% of the 3.43 billion tons in the leased areas. Also, it is highly unlikely that all coal with development potential would be mined, because currently, coal companies rarely extract coal under more than 200 feet of overburden, whereas coal with development potential has up to 500 feet of overburden.

Exchange of coal for coal in alluvial valley floors and through legislative dictums could remove a significant amount of coal from development potential status. These exchanges are mandated by law and regulation and are not discretionary. There would be no impacts on the coal resource from vegetation utilization actions.

Impacts could occur to the availability of the coal resource if sale or exchange of the surface permitted the new surface owner to deny consent to mine underlying federal coal in emergency lease areas. However, since areas of currently defined coal with development potential have all been placed in the "retention" category, the acreage involved would be small and impacts would be insignificant. It is possible that some of the 164,723 surface acres proposed for exchange or sale could occur in areas with unknown coal potential. A significant loss of potential revenues from federal coal could occur if areas of unknown coal potential were disposed of. Coal ownership would be retained if the lack of coal were not demonstrated in the site specific mineral report required for each disposal action. However, disposal of the surface could affect surface owner consent in the long term.

In the short and long term, the coal resource in Zook Creek would not be suitable for coal lease consideration, resulting in the irreversible and irretrievable commitment of the resource to preservation. This impact would involve 8,438 acres of coal land, containing 464 million tons of coal with development potential. This coal is 0.6% of the total federal coal with development potential and is distant from areas of current or proposed mining, so the impact to coal development would be insignificant.

In the short and long term, the coal resource in Buffalo Creek would not be suitable for coal lease consideration, resulting in the irreversible and irretrievable commitment of the resource to preservation. This impact would involve 5,933 acres of coal land, containing 70 million tons of coal with development potential. This coal is 0.1% of the total federal coal with development potential and is distant from areas of current or proposed mining, so the impact to coal development would be insignificant.

Summary

There would be significant impacts from coal actions, no impacts from vegetation utilization actions, no known significant impacts from land actions and insignificant impacts from wilderness actions.

Other Minerals

No oil or gas fields are within the acceptable coal areas, therefore, no impacts are expected to occur in the short term. Long-term impacts are unknown. The only other known mineral resources of note in the coal areas are clinker and sand and gravel. Because they are very abundant, conflicts with coal actions are expected to be insignificant.

There would be no impacts to other minerals from vegetation utilization actions.

Disposal of the surface estate over reserved oil and gas minerals would have the impacts of: (1) reducing the BLM workload of checking reclamation from seismic exploration, and (2) complicating the permitting process for the lessee, since an additional participant (the surface owner) besides BLM would be involved. These impacts would not be significant.

There would be no impacts on claimed locatable minerals, since lands with mining claims recorded under Section 314 of FLPMA are prevented from being exchanged or sold. Disposal of the surface estate would prevent unclaimed locatable minerals from being claimed and recorded, pending regulations issued by the Secretary of the Interior. The resulting short- and long-term impacts would not affect BLM, since the federal government receives no royalties from locatable minerals, but impacts would occur to private mining parties who lose access to potential mineral resources. Some of the 164,723 acres proposed for exchange or sale would be significantly affected, especially in the Alzada area.

Disposal of the surface estate would not affect BLM ownership of underlying mineral materials. A 1983 U.S. Supreme Court decision affirmed public ownership of sand and gravel on lands where the surface only was patented. Mineral entry rights would be preserved.

There are no mining claims at Zook Creek, so there would probably be no impact to the locatable minerals resource. However, claims could be located until actual designation as wilderness. Thereafter development could occur on valid claims. There are existing pre-FLPMA oil and gas leases on 5,831 acres which could be developed. There would be no impact to oil and gas development from these leases. The remaining 2,607 acres are under post-FLPMA leases, which permit development if it would not impair wilderness values. Impacts to oil and gas development from these restrictions could be significant. Under 1983 policy, leases that expire will not be reissued. With these exceptions, the minerals resources would be committed to preservation, which, because of the size and potential of the WSA, is an insignificant impact.

There are no mining claims at Buffalo Creek. There are no existing pre-FLPMA leases and 5,012 acres of existing post-FLPMA leases at Buffalo Creek. In addition, there are 638 unleased acres, which would not be leased. The same considerations as stated for Zook Creek would apply to Buffalo Creek.

Summary

There would be insignificant impacts to other minerals from coal actions, no impacts from vegetation utilization actions, significant impacts from land actions in localized areas and no significant impacts from wilderness actions.

Range

During mining and reclamation, there would be an approximate loss of 7,878 AUMs on currently leased lands, over a period of years. No additional range improvements would be proposed on any coal leases. The most serious effect on vegetation after reclamation would be the irretrievable and irreversible loss of the natural vegetative mosaic and species diversity on all 39,391 acres. However, vegetation production may be better after mining, due to extensive reclamation work.

Livestock vegetation use would be 177,491 AUMs and wildlife, watershed protection and other nonconsumptive uses would be 654,841 AUMs in the short term (5 years). Long term (15 years) livestock vegetation use would be 232,608 AUMs and wildlife, watershed and other nonconsumptive uses would be 701,727 AUMs through range improvements on the 303,649 acres of selected fair and poor condition rangeland. Range condition would be expected to improve in the long term by 28%. This increase in AUMs would be the result of management practices to protect wildlife and watershed values.

The overall effect of the proper application of mechanical treatments on 125,023 acres over the long term would be an improvement of range condition and a 100% increase in vegetation production.

Development of structural range improvements would reduce available forage by 1,819 AUMs during construction, but would increase the overall range condition on those acres that are selected for range improvements.

The 72 potential activity plans on 215,905 acres, when implemented, would have an increase in plant vigor and species diversity. There would be a 15% increase in range condition and a 12% increase in AUMs.

The 12 functional AMPs would have no new impacts on vegetation production.

As the 15 nonfunctional AMPs become more functional, there would be an increase in plant vigor and species diversity. There would be a 15% increase in range condition and a 12% increase in AUMs due to possible changing of grazing systems. However, because of the relatively small number of acres, totaling 24,426, there would be an insignificant increase in range condition.

The wildlife projects that would be constructed would have no impact on vegetation production.

Improved management, range improvement placement and use supervision would result in improvement of 5,000 acres of riparian areas to a healthy woody riparian condition, having all age classes of trees represented with 30% or more of the stand being sapling or younger. Reduced use of riparian zones as forage areas and shade sources for livestock would result in an increase in cover and plant community structure and health.

Control of 40 acres of prairie dog towns would have an immediate effect of improving vegetative production and range condition. Production would increase 100% because of improved plant vigor and the transition of the plant community from low to high producing species. Increased vegetation, shade and litter would increase site moisture retention and improve plant growth conditions.

Control of 130 acres of noxious weeds would result in a 200% increase in range condition through increases in desirable plant species, useful vegetation production and improved soil protection.

The short-term effect of prescribed burning on 20 acres and 500 acres burned from wildfires would be a loss of all forage being produced on the site. The long-term effect depending on the range site would be a 50 to 70% increase in livestock forage through recovery of more desirable plant species.

Vegetation Utilization—Livestock

Short-term use levels would reduce livestock AUMs by 30,592. Long-term increased use levels of 55,117 AUMs would provide feed for an additional 6-month grazing season for adult cattle.

Livestock stress, due to moving livestock between pastures, would increase slightly on potential activity plans, if implemented. Reliable spring livestock forage and cover for young calves would be provided in grazing systems. Livestock breeding success would be improved by fencing, which would create closer stock confinement. Changes in grazing management practices on allotments without activity plans would be minor and have little impact on stock.

All allotments were analyzed. The allotments that do not require improvement would remain the same as current management.

Livestock production would increase and grazing distribution would improve because of land treatments and range improvements. There would be no significant impact to livestock.

There would be a short-term loss of 2,358 AUMs and a long-term loss of 8,237 AUMs from land sales. The sale of these tracts would result in reduced grazing administration costs.

There would be a short-term loss of 7,074 AUMs and a long-term loss of 24,709 AUMs from land exchanges. The loss of AUMs could be offset by similar or greater vegetation production in lands gained from exchanges. Exchanges which consolidate large tracts of public lands would result in more efficient grazing administration.

Land disposal through R&PP actions would have no significant impact on the range resource.

Recommending Zook Creek as suitable for wilderness designation would have no impact on the range resource. There would be restrictions on using mechanical equipment for range management practices.

Recommending Buffalo Creek as suitable for wilderness designation would have no impact on the range resource in the short term. In the long term, 689 acres would be upgraded to good condition by range improvements. There would be an increase of 144 AUMs for livestock and 432 AUMs for wildlife and other nonconsumptive uses.

Summary

There would be significant cumulative impacts on vegetation from coal mining, land sales and vegetation utilization actions. Impacts on vegetation from land exchanges and wilderness actions would be insignificant. A total of 98% of the rangeland would be in good or better condition after improvement.

Hydrology

Coal—Surface Water

Impacts to surface water quantity from coal mining are expected to be insignificant during mining and reclamation. Streamflow downstream of the mine sites would be retarded and possibly reduced by sedimentation ponds on the mine site. The overall effects would be to reduce flood peaks and slightly reduce stream flows. Surface runoff and associated peak flows would probably increase by approximately five percent, due to the decreased infiltration capacity of spoils immediately following reclamation (Arnold and Dollhopf 1977). Dollhopf (1979) predicts that the infiltration would improve as root systems develop and become similar to native rangeland. It is estimated to take 10 to 15 years to regain prior infiltration capacity. The net long-term effect of mining on surface water quantity would be insignificant.

Impacts to surface water quality are also generally expected to be insignificant during mining and reclamation. State regulations limit amounts of suspended solids, iron, manganese, and acidity in waters discharged from mined land. Monitoring is required to assure compliance. Impacts could be significant in isolated areas where groundwater from a mining area is the major contributor to the surface water drainage. In such areas water would probably remain suitable for stock use, but not for agriculture. During mining, increased sediment loading from disturbed areas would be trapped by sedimentation ponds. After mining, sediment and water yields would be reduced by 23 ac ft/yr and 1,096 ac ft/yr, respectively, assuming reclamation and revegetation are successful (Table 4-19).

After reclamation, groundwater discharging from mined areas and carrying an increased salt load from leaching would add significantly to the salinity of nearby springs, seeps, and intermittent streams. The degree of increase depends on the geology of the area, but general increases of 500 to 2,000 mg/1 TDS can be expected (MDSL and OSM 1983). Rahn (1976) found these increases typically were sulfates, calcium, magnesium and bicarbonates. Van Voast et al (1978) speculate that most materials available for dissolution in the reclaimed spoils would be flushed with the first pore volume of water. However, in dry climates, such as found in eastern Montana, this process may take hundreds to thousands of years. In a practical sense, the impacts would be cumulative from all mined areas where salts were not flushed. Van Voast and Thompson (1982) have shown that no single mine can cause significant impacts to the Tongue River's quality or rate of flow. It is the cumulative effects from several mines which have the greatest chance of impacting a region's water resource. Estimates made by Van Voast for cumulative effects caused by nine active or proposed mines in the vicinity of Decker, Montana, show that post-mine groundwater reaching the Tongue River would increase its median dissolved solids content from 480 mg/1 to 510 mg/1.

A USGS modeling study (Woods 1981) predicts that Tongue River salinity would increase four to five percent following strip mining of 120,000 acres of federal land in southeastern Montana. This is less than one-tenth the increase caused by withdrawal and return flow of irrigation water. These results indicate that long-term regional cumulative effects from mines would not be significant in the Tongue River, but could be significant in smaller streams where groundwater from mined areas contributes a larger percentage of total surface water flow.

TABLE 4-19
SUMMARY OF WATERSHED IMPACTS
ALTERNATIVE D

Element	Sediment Yield (ac ft/yr) Initial	Sediment Yield (ac ft/yr) Long Term	Water Yield (ac ft/yr) Initial	Water Yield (ac ft/yr) Long Term	Surface Water Quality Long Term	Groundwater Quality Long Term
Grazing Treatments	827	818	28,424	28,186	+	0
Mechanical Land Treatments	344	I	11,830	I	+	0
Fences	6	12	195	347	—	0
Water Developments (wells, springs, res.)	I	I	I	I	0	0
Fire	1	I	43	I	+	0
Chemical Treatments						
Noxious weeds	10	5	311	183	0	0
Prairie dogs	3	2	96	56	0	0
Riparian Area	14	1	468	137	+	0
Coal Mining	69	46	3,461	2,365	—	—
TOTAL	1,274	884	44,828	31,274	+	—

I — insignificant
+ — increase
0 — no change
— — decrease

SOURCE: Omang, Parrett and Hull 1983, and BLM 1983 and Appendix I

Coal—Groundwater

During mining, impacts to the local groundwater would be significant. Aquifers in the overburden and coal would be disrupted. Springs, seeps, and shallow wells in the immediate mine area would dry up or experience lowered water levels. Drawdown in wells caused by mining has been observed to extend from less than one-half mile to three miles (Hardaway and Kimball 1979; Van Voast et al 1978; Dollhopf et al 1978). The influence would vary with the direction of groundwater flow and would be typically greater in the down gradient direction (Van Voast et al 1977). After reclamation, impacts would be mitigated as the coal seam and overburden aquifers are replaced by a spoil aquifer. Depth and flow of groundwater in spoils would not differ greatly from conditions in undisturbed coal aquifers, but it may take several years for water levels to recover (Van Voast et al 1978).

According to Hardaway and Kimball (1978), a variety of professionals indicate that impacts are not significant on groundwater quality during mining. A mine acts as a sink for groundwater and precludes any possible flow of contaminants into the groundwater system. Water intercepted during mining is pumped into holding ponds and discharged only in accordance with state regulations. Seepage from holding ponds has impacted downstream areas in isolated cases. Impacts can be mitigated by diligent pond construction methods.

In reclamation, overburden is used to refill the pits, thus exposing new surfaces to invading groundwater. These fresh surfaces contain significant quantities of leachable salts and minerals that readily dissolve. Thus, groundwater in mined areas shows increases in dissolved solids. The spread of pollutants from reclaimed areas is difficult to predict. Van Voast (1980) and Ahern and Frazier (1981) state the areal extent is modified by sorption, chemical precipitation, and dilution and may be limited to a few hundred yards from pit boundaries. Other studies (Rahn 1976 and Moran et al 1976) suggest this spread may extend several miles downgradient from pit boundaries.

Coal—Hydrology Summary

Present and anticipated levels of coal mining indicate that regional impacts to surface and groundwater sources from coal mining would be insignificant. However, in localized areas there would be significant impacts to groundwater quantity during mining and reclamation. These impacts would be reversible and retrievable. Significant impacts to groundwater quality in localized areas would occur and would be irretrievable and irreversible.

Vegetation Utilization—Livestock

Construction of range improvements such as fences would result in increased sediment and water yields of six ac ft/yr and 152 ac ft/yr, respectively. The increase would be caused largely by livestock trailing along new fences.

Development of reservoirs and pits would temporarily disturb soil. Nearly all soil disturbance would be upstream of dams and would not contribute sediment below the dam. Development of springs and wells would disturb an insignificant amount of soil and would not impact sediment or water yields.

Mechanically treated areas would be exposed initially to wind and water erosion. However, infiltration would be improved, leading to increased soil moisture and vegetative cover (Wight and Sidoway 1972; Ryerson et al 1980; Saulman 1973; Neff and Wight 1977; Neff 1980). Sediment and water yields would be reduced by 344 ac ft/yr and 11,830 ac ft/yr, respectively. Mechanical treatment would not occur if holders of downstream water rights would be adversely affected.

Continued development and revisions of allotment management plans would slowly improve watershed condition. Sediment and water yields would consequently be reduced slightly in the long term by nine ac ft/yr and 238 ac ft/yr, respectively.

Special management considerations for approximately 5,000 acres of riparian areas would result in less stream bank erosion and improved water quality (Holecheck 1980). Sediment and water yields would be reduced slightly in the long term by 13 ac ft/yr and 331 ac ft/yr, respectively.

Control of 40 acres of prairie dog towns and rehabilitation of the town sites would have an insignificant impact to water resources in the short term. In the long term, the cumulative impact would be to reduce sediment and water yields by one ac ft/yr and 40 ac ft/yr, respectively, a very slight reduction.

High concentrations of noxious weeds force livestock to graze noninfested areas. Consequent reductions in vegetative cover would increase sediment and water yields (Noble et al 1979). Treatment of 130 acres of noxious weeds would result in reductions of sediment and water yields of five ac ft/yr and 128 ac ft/yr, respectively.

Acres burned by either prescribed burns or wildfires would expose bare ground to water erosion. Sediment and water yields would increase very slightly in the short term by one ac ft/yr and 43 ac ft/yr, respectively. Natural revegetation of burned areas in the long term would return sediment and water yields to pre-burn conditions.

Lands—Hydrology

No significant impacts to water resources would result from land sales or exchanges.

Wilderness—Hydrology

Zook Creek and Buffalo Creek WSAs would be recommended suitable for wilderness designation. Designation would have little effect on current land use due to the remoteness of the areas. Therefore, insignificant impacts would be expected to water resources.

Summary

Cumulative sediment and water yields would be reduced by 390 ac ft/yr and 13,554 ac ft/yr, respectively, a moderately significant reduction. Significant losses in groundwater quantity and quality would occur in localized areas near mine sites. Mechanical treatments would significantly reduce sediment and water yield. Other vegetative, lands, and wilderness actions would have no significant impacts on water resources.

Soils

Impacts to the soil during coal mining would involve significant increases in erosion and runoff on 39,391 acres. Losses from wind and water erosion would be 1,723 acre feet of soil over the entire area disturbed. Reclamation potential is questionable on 5,000 acres that are in land capability Classes V, VII and VIII because of topography, depth to bedrock, rock outcrops and steepness of slope. Direct impacts to the soil from mining disturbances would alter the soil structure and porosity. This alteration would affect permeability, infiltration rates, soil-air and soil-water relationships and bulk density. The natural fertility would be reduced by disruption of the nutrient cycle and a decrease in the organic matter content.

Proper replacement of subsoil and topsoil is critical for successful reclamation. Salt migration to the surface after profile reconstruction is possible, increasing the sodium content of the topsoil from its original level. This could decrease plant production and lower reclamation success. If layers of toxic soil material and restrictive layers are replaced lower in the profile than where they were originally found, plant production may be better after reclamation. With proper mitigation, there would be no impacts to the soils resource after reclamation.

This alternative would provide for the quickest improvement in the watershed to good condition through deferment of livestock grazing during April, May and June on the 303,649 acres of fair and poor condition lands. As a result of the 3-month spring deferment, there would be a 25% reduction of cattle trampling, soil compaction, stream bank sloughing, and more vegetative ground cover. This would allow plants time for phenological development that improves plant production and would allow establishment of the optimum percent ground covers on the various range sites (Figure 3-4, Soil Target Covers on Range Sites).

Approximately 125,023 acres have the potential to be mechanically treated, which would cause an annual loss of 175 acre feet of soil from wind erosion. Wind erosion would cause 22 acre feet of soil loss from the construction of 320 reservoirs, pits and pipelines and one acre foot of soil loss from livestock trampling along 100 miles of new fence lines.

Prairie dog control on 40 acres would increase vegetative cover 100% in the long term and reduce runoff and erosion.

Noxious weed control on 130 acres would initially kill vegetation, leaving dead plant residue that would help control wind and water erosion. In the long term, the treated areas would have a 200% increase in range condition through an increase of desirable plant species, minimizing erosion hazards.

Prescribed burning on 20 acres and 500 acres burned from wildfires would remove most vegetation, leaving only plant residue in the short term. This would increase the available plant nutrients in the soil, but also would cause accelerated erosion and the loss of organic matter. In the long term, there would be a 50 to 70 percent increase of vegetation over the current production level, which would minimize erosion hazards and offset the short-term soil losses. See Table 4-19, which summarizes sediment yields from water erosion by range improvements.

In the short term, there would be a loss of 197 acre feet of soil through wind erosion from project construction. In the long term, there would be no significant loss of soil.

The sale of 41,181 acres would not impact the soils resource except where there may be a change in land use. The type of change made, i.e., agriculture and road or building construction, would determine the amount of erosion. This is expected to be an insignificant loss.

The exchange of 123,542 acres would not impact the soils if there is not a change of use, since an equal value of lands would be received.

The disposal of lands through a R&PP action would have an insignificant impact on the soils resource if a land use change were to occur.

Minor positive long-term impacts to the soils resource at Zook Creek and Buffalo Creek WSAs would result because of the prohibition of general off-road vehicle use and the limitation of range improvements.

Summary

The cumulative loss of soil from coal mining and vegetation utilization actions would be 1,920 acre feet (1,723 and 197 acre feet, respectively). The losses from these actions would be insignificant with proper mitigation. Impacts from land and wilderness actions would be insignificant.

Wildlife

Coal development on 39,391 acres currently leased would have little local impact on wildlife, if mitigation for the loss of wildlife habitat were successful. Wildlife habitat mitigation required under state and federal regulations would limit most impacts to the mining and reclamation phase. As mining occurs, wildlife habitat would be destroyed. That would be a significant impact.

Each of the 22 current federal coal leases identifies wildlife concerns where they occur within each lease. Total restoration of some habitat types, such as steep breaks and woody draws, has not been fully demonstrated. Areas that are reclaimed would have the potential to produce high quality spring and summer habitat.

During mining, development and increased harassment would cause movement of wildlife species to less disturbed habitats. Increased human activity would result in increased poaching. These impacts would be significant during the mining and reclamation phase. Species distribution would return to a more natural state with the completion of reclamation. Because it has not been shown that all types of wildlife habitat can be successfully reclaimed, impacts to wildlife would be significant in localized locations.

Although no major fisheries would be directly impacted, the watersheds in the potential mining areas do influence water quality of Yellowstone River tributaries. Each of these is important to the local sport fishery, and impacts caused by mining could be significant. Mitigation during and after mining should target potential siltation and water quality and flow problems.

All known threatened and endangered species use areas were eliminated from further lease consideration in the application of unsuitability criteria, where inventory was complete. Increased development and human activity would result in increased disturbance of transient threatened and endangered species, including bald eagles and peregrine falcons, which may migrate through developed areas.

Any emergency leases or coal exchanges which may develop under this alternative must be considered on a case-by-case basis, to assure the protection of critical wildlife habitat.

Vegetation utilization of 654,841 AUMs in the short term and 701,727 AUMs in the long term for wildlife and nonconsumptive uses would be very beneficial to wildlife. A livestock utilization reduction of 30,592 AUMs would result in a four percent increase in residual vegetation available as food and cover for all wildlife species and as ground cover for soil and watershed protection.

There would be no significant impacts on wildlife during the short term. Mitigation measures and project stipulations on range developments would result in an overall benefit to wildlife. In the long term, range condition would improve and would result in improved wildlife habitat.

Mechanical treatments of up to 125,023 acres would occur only where they would not harm wildlife habitat. Vegetation manipulation would alter the wildlife population density and diversity in the treated areas. All wildlife would be displaced temporarily. The expected 15% increase in succulent spring grass and forbs would benefit some species seasonally. Increased vegetative diversity would increase the abundance and diversity of wildlife species. Big sagebrush habitat, critical to antelope and sage grouse survival, would be evaluated on a case-by-case basis to protect that resource.

Since wildlife concerns would be addressed in each of the 72 potential activity plans, wildlife impacts from disturbance or destruction would be minimal. Range improvements totaling 410 projects would displace wildlife temporarily on 572 acres, due to habitat disruption and increased human activity. Developed water sources would be beneficial to wildlife. They would help break up heavy concentrations of livestock at overused watering sites and would provide additional water sources for all forms of wildlife. Care would be used in selecting water development sites to avoid damage to important wildlife use areas such as woody draws.

Construction of 100 miles of fence would result in better distribution of livestock. Fences would be constructed so as to minimize movement barriers to big game wintering and concentration areas.

Increased wildlife/livestock competition in areas to which livestock are redistributed would be offset by increased residual vegetation available in the areas from which the livestock are moved.

Grazing systems which provide spring rest or deferment would improve the quality and quantity of forage, especially forbs, and would make them more available to deer, antelope, bighorn sheep and grouse. The quality and quantity of nongame forage and cover would increase as a result of grazing treatments.

Upland game birds require the residual vegetation usually found in areas of light or no grazing for nesting and winter survival. Through the use of grazing systems or treatments to provide greater distribution of cattle, residual cover in the current low or nonuse areas would be decreased. However, this would allow for greater vegetation production in the current high use and concentration areas to offset the loss.

Additional residual vegetation and greater vegetative production due to the use of grazing and land treatments would help upland nesting waterfowl. Residual vegetation for nesting and brood rearing would be available near reservoirs and in rested or deferred pastures.

Fencing approximately 21 of the new water developments would benefit nesting birds by providing four to eight acres of residual vegetation for cover at each site.

The average annual installation of 20 bird ramps in stock tanks would be beneficial to all small wildlife species that use these water sources. The ramps help prevent the drowning of small animals. The continued construction and placement of an average of 20 bird nest boxes and 10 goose nesting platforms annually would benefit mainly waterfowl, kestrels and bluebirds. The average annual construction of one livestock exclosure around a new pond development would benefit waterfowl by providing undisturbed nesting cover. The continued stocking or restocking of gamefish in two stockponds annually would benefit the general public by maintaining good fisheries. Reservoirs identified as suitable for recreational fishing would be fenced to provide and maintain a quality fishery. A tank, water gap or other means of livestock access to water would be provided.

Maintaining woody riparian reproduction in areas to provide 30% of the woody species as saplings or younger trees would assure continued age class diversity in the system. This would assure the availability of browse for use by wildlife through winter months.

Control on 40 acres of prairie dogs would further reduce the known prairie dog acreage by 1.5%. There is concern that as this natural habitat is further reduced, the prairie dog and associated species would reach dangerously low population levels, locally as well as regionally.

The treatment of 130 acres of noxious weeds, particularly Canada thistle, would reduce the available food for seed-eating birds. The small acreage treated would have minor impacts on wildlife.

Implementing prescribed burn plans on 20 acres annually and modified fire suppression plans would eliminate some dense vegetation. Although some wildlife species do require dense trees or shrubs, extensive areas of dense vegetation could be of greater value to wildlife if they were thinned with scattered openings.

There would be no significant impacts on threatened or endangered species. Each range improvement project would be surveyed for the occurrence of threatened or endangered species; recommendations would be made for appropriate mitigation or project stipulations. Any control of prairie dogs would decrease the potential habitat for black-footed ferrets.

Disposal of 165,054 acres would mean the loss of BLM control on that wildlife habitat. The lands program also offers potential for the exchange of lands having equal or greater wildlife habitat values, which would benefit from public ownership. With over 15% of the public lands considered for disposal, there would be moderate negative impacts on wildlife habitat, depending on the vehicle for disposal. These losses would be less with a higher percentage of exchanges rather than sales. In exchanges, little significant wildlife habitat would likely be lost, and some may even be gained. In land sales, consideration would be given to major wildlife concerns, but BLM would lose control of any wildlife habitat which would be sold. Since major wildlife concerns would be addressed on a case-by-case basis early in the discussions of any land exchange or sale, significant impacts would be considered in the decision process. Those impacts would be reduced or mitigated as much as possible. Threatened and endangered species habitat would be given special consideration before any land transactions, to avoid adverse impact to threatened or endangered species. Overall the impacts from lands actions would be insignificant.

Recommending the Zook Creek WSA as suitable for wilderness designation would protect the known sharp-tailed grouse, turkey and mule deer habitat. Recommending the Buffalo Creek WSA as suitable for wilderness designation would protect the known raptor nesting sites in the area. However, the mere designation of a block of land as wilderness does not automatically imply either benefit or detriment to wildlife. A large block of land without vehicle access does provide a secure area for wildlife. On the other hand, the lack of vehicle access to large blocks of land often results in the loss of game harvest as a wildlife management tool.

The identified environmental consequences on these two areas are based on extensive but incomplete inventory data; these site specific consequences cannot be extrapolated to the entire Resource Area where the habitat diversity is vastly greater.

Summary

Overall, there would be no significant cumulative impacts to wildlife from coal, vegetation, land or wilderness actions.

Cultural Resources

Mining would affect 153 cultural sites on tracts with existing inventory. Previous evaluations of cultural resources indicate that between five percent and 20 percent of the sites may be significant and eligible to the National Register of Historic Places. Once prescribed mitigation in laws, regulations and policies pertaining to cultural resource management were followed, impacts of mining would be minimal.

Improved range condition would generally benefit cultural resource sites by increasing ground cover and reducing erosion. However, some developments such as mechanical treatments and burning would destroy the context or structure of a site. Through existing policies for mitigation, the impacts of ground-disturbing treatments on cultural resource values would be minimal.

Lands identified for potential sale, exchange or other disposal action would be inventoried for prehistoric and historic sites. Through existing policies for mitigation, the effects on cultural resource values would be minimal.

Generally, prehistoric sites and some historic sites and features are compatible with both WSAs designated as wilderness. Some historic sites may qualify as features which enhance the quality of the natural environment or may serve as a facility for a permitted activity. The principal adverse effects of wilderness designation could include unmonitored natural soil erosion, vandalism, and natural deterioration of structures and features. Through existing policies for mitigation, the effects on cultural resources would be minimal.

Summary

The impacts of all actions on cultural resources would be minimal.

Paleontologic Resources

Impacts on the paleontologic resource by coal mining would be insignificant. Plant and mollusk fossils are widespread and common throughout the mineable portions of the Fort Union and Wasatch formations. No significant fossil localities have been recorded in the coal areas cleared.

Paleontologic resources would be slightly affected from vegetation utilization actions. Some trampling of significant localities by livestock would occur. Avoidance or collection of paleontologic material when constructing range projects would occur on a case-by-case basis. Special emphasis would be placed on projects located in the Hell Creek formation to avoid damage to significant localities.

Approximately 19,000 acres or 12% of the 165,054 acres identified for disposal and 570 acres or 21% of the 2,760 acres identified for further study fall within the exposures of the Hell Creek formation. A potential loss within the Hell Creek formation of 4,892 acres due to sales and 14,678 acres due to exchanges would occur. There would be an overall loss to the public of paleontologic resources on a maximum of 19,570 acres (21% of the Hell Creek formation exposed on public land) in a "worst case" situation with no mitigation measures applied to the exchanges.

There would be no impacts on the paleontologic resource from wilderness actions.

Wilderness

ZOOK CREEK WILDERNESS STUDY AREA

No direct impacts would occur to the Zook Creek WSA due to coal mining. There would be no impacts on wilderness characteristics from coal development outside of the WSA.

Oil and gas development on 5,831 acres of pre-FLPMA leases is not likely. If it occurred, it would significantly affect the naturalness of the area. Oil and gas development on 2,607 acres of post-FLPMA leases would have no impact on wilderness characteristics.

Management of vegetation in Zook Creek, including maintenance of projects, would not impair the wilderness characteristics of the WSA. There would be no impacts on wilderness characteristics from range developments or surface treatments outside of the WSA.

There would be no impacts on wilderness characteristics from lands actions outside of the WSA, except if public access were gained through land exchanges.

There would be no impact on wilderness characteristics due to off-road recreational vehicle use, forest management, or inventory and management of cultural resources.

The wilderness characteristics of Zook Creek would be p]reserved. This designation would increase the diversity of the National Wilderness Preservation System and include a Great Plains short grass prairie, eastern ponderosa pine area in the system.

The area is manageable as wilderness. This is due to the configuration of the area, the absence of inholdings, and the anticipated absence of development of pre-FLPMA oil and gas leases.

BUFFALO CREEK WILDERNESS STUDY AREA

No impacts would occur to the Buffalo Creek WSA due to coal mining.

There would be no impacts on wilderness characteristics from coal development outside of the WSA.

There are no pre-FLPMA leases. Oil and gas development on 5,012 acres of post-FLPMA leases would have no impact on wilderness characteristics.

Management of the vegetation resource in Buffalo Creek, including maintenance of projects and the construction of two miles of fence, would not impair the wilderness characteristics of the WSA.

There would be no impacts on wilderness characteristics from range developments or surface treatments outside of the WSA.

There would be no impacts on wilderness characteristics from lands actions outside of the WSA, except if public access were gained through land exchanges.

There would be no impacts on wilderness characteristics due to off-road recreational vehicle use, forest management, or inventory and management of cultural resources.

The wilderness characteristics of Buffalo Creek would be preserved. This designation would increase the diversity of the National Wilderness Preservation System and include a Great Plains short grass prairie, eastern ponderosa pine area in the system.

The area is manageable as wilderness. This is due to the configuration of the area and the absence of inholdings.

Lands

There would be no impacts on the lands resource resulting from coal mining, vegetation management or wilderness actions.

Exchanges of 123,542 acres would result in a significant increase in management efficiency and public use by consolidating isolated, inaccessible tracts, acquiring access to bodies of water and large tracts, and acquired land or easements for preservation of cultural, historical, paleontological and recreation sites. This action would reduce the administrative costs for maintaining these small, isolated tracts and retain a balance of natural resources. Sales of isolated, inaccessible tracts would result in an irretrievable loss of 41,181 acres from public ownership. However, these lands are inefficient to manage and are unuseable by the public. Therefore, the impact would be minimal. Disposal under the R&PP Act results in a significant beneficial use by the public.

Summary

There would be no impacts from coal mining, vegetation management or wilderness actions. There would be a significant beneficial impact from land actions.

Recreation

Mining on all 39,391 acres would have an insignificant impact on recreation. This acreage would be removed from recreational use until reclaimed.

The 300 additional reservoirs and pits would improve hunting potential through the dispersion of wildlife and would increase the fishing resource. The 50 two-mile sections of fences would inconvenience hunters by restricting their movements. This would be an insignificant impact. Mechanical treatment of 125,023 acres would result in localized short-term reductions in hunting habitat, which would be an insignificant impact in the long term.

Recreation, especially hunting and wildlife observation, would benefit from the woody riparian vegetation management techniques. The control of prairie dogs and noxious weeds, and prescribed burning at these levels would result in no impacts.

The sale of 11,789 acres in the short term and 41,181 acres in the long term would result in an insignificant impact to recreational opportunities. These lands are generally isolated from the public due to the lack of access. The exchange of 35,369 acres in the short term and 123,542 acres in the long term would allow public land to be consolidated, and access gained to isolated tracts and bodies of water. Also, exchanges would aid the Montana Department of Fish, Wildlife and Parks in meeting its objectives of gaining access to bodies of water, access to public land for hunting purposes and continued blocking up of public land at or near significant historic sites. Increased access to public lands and bodies of water would aid the BLM in meeting the long-term demand for recreation. Therefore, exchanges would have significant beneficial impacts. Recreation would benefit from R&PP actions. However, the resource would be managed by agencies other than the BLM.

Recommending Zook Creek and Buffalo Creek WSAs as suitable for wilderness designation would prohibit the use of off-road vehicles; therefore, hunting would be affected in the short and long term. This would significantly impact recreation in the Buffalo Creek WSA; Zook Creek has minimal ORV use; therefore, this impact would be insignificant. There would be a benefit to scenic resources in both areas, because of the general absence of surface disturbing activities. Wilderness designation would enhance all types of compatible nonmotorized recreation in the long term.

Summary

There would be insignificant impacts on recreation from coal mining and vegetation utilization actions. The sale of lands would insignificantly affect recreation, but exchanges would have a significant beneficial impact. Wilderness actions would have an insignificant impact on Zook Creek, but a significant impact on Buffalo Creek.

Air Quality

Concentrations of TSP would be elevated in the vicinity of any mining activity. Depending on the situation, average annual concentrations of TSP at the mine area boundary would range from 20 to 90 mg/m^3 and second highest 24-hour concentrations would range from 75 to 260 mg/m^3. These concentrations would fall back to one mg/m^3 above baseline levels at a distance of two to nine miles from the active mine area, in worst case situations (PEDCo SSAs 1983). Increases in particulate and gaseous pollutants would be a phenomenon that would be insignificant except in the immediate vicinity of active mining. Successful land reclamation would eliminate degradation of air quality. Impacts resulting from the proposed action would be limited to degradation of air quality and insignificant climatological changes during mining and reclamation.

Increments of TSP are not consumed by mining, under the PSD ruling, unless the mining occurs within a designated impact area of a major polluting source. There are no such impact areas for TSP in the Resource Area now, consequently no mining activity will consume TSP increments, either in the Resource Area or in the Northern Cheyenne Indian Reservation Class I area. Mining could affect AQRV on the Class I area. The AQRV most likely to be affected by mining would be visibility. The visibility reduction modeled for the closest proposed coal tract to the reservation was an imperceptible and insignificant 0.7 percent.

Fugitive dust generated by wind erosion on the moderate to severely susceptible soils has elevated TSP to an average background concentration of 15 mg/m^3. This would continue on a long-term basis. Land treatments increase surface exposure and raise fugitive dust concentrations to about 30 mg/m^3 over the short term. Until vegetation is well established, increased vegetative production would have a positive effect on reducing fugitive dust generation from wind erosion. There would be a 27.3% reduction in TSP for 14.8% of the land area, resulting in a concentration for those lands of about 12 mg/m^3.

Meteorological conditions, such as inversions, sometimes permit high concentrations of particulate matter to accumulate in localized areas. However, they are small in scale and quickly dispersed. In the long term, land treatments would enhance air quality by reducing TSP concentrations to about 10 mg/m^3 for range in excellent condition. Chemical control of noxious weeds could produce very localized, short-term, virtually unmeasurable impacts to air quality by drifting in and around the treatment areas. Prescribed burning would elevate the concentration of airborne particulate matter in localized areas over the short term. Concentrations of particulates eight hours after the burn would be on the order of 500 mg/m^3 and this would be reduced to 20 mg/m^3 above background within 24 hours of the burn. Impacts from all the described activities are considered insignificant in that they rarely, if ever, result in the violation of standards. Certainly no irreversible commitment of the air resource is posed by these land management practices.

Lands involved in sales or exchanges could be farmed once they come under private ownership. These actions would only contribute minimally to air quality impacts currently being experienced. Otherwise, there would be no impacts on air quality as a result of lands actions.

Designating Zook Creek and Buffalo Creek WSAs as wilderness would have insignificant impacts on air quality.

Summary

Coal mining actions could affect AQRV on the Northern Cheyenne Indian Reservation, a Class I area. The AQRV most likely to be affected would be visibility. Impacts from any vegetation utilization action would be insignificant in the short term and beneficial in the long term. No impacts to air quality would be experienced from lands actions, except where lands are developed for farming. Wilderness actions would have insignificant impacts on air quality.

Forestry

Approximately 240 acres of commercial and noncommercial (woodland) forest land on public surface would be irreversibly and irretrievably lost, if all areas were mined. This assumes that there continues to be no proven reclamation techniques that can successfully reestablish ponderosa pine forests on previously mined land. This figure is less than one percent of the total BLM administered forest land and represents less than one percent of the total federal and Indian forest land in the Resource Area.

Since the Resource Area has no established allowable cut, the loss of public forest land would not impact the Bureau's forestry program during mining and reclamation or after reclamation. However, the amount of Bureau forest resources available for incidental sales of firewood, Christmas trees, sawlogs and posts and poles would be insignificantly reduced. In addition, the loss of forest cover would insignificantly affect other Bureau programs, especially wildlife and recreation.

Approximately 1,270 acres of forest land on private surface over federal coal would be lost if all areas were mined. The impacts due to the loss of private forest land would be essentially the same as the loss of public forests land.

The cumulative impacts from the combined loss of public and private forest land would be insignificant to the forest products industry.

There would be no impacts to the forest resource from any of the vegetation utilization actions. A maximum of 17,686 acres of commercial and noncommercial (woodland) forest land would be removed from public ownership because of sales or exchanges, where no similar land is acquired. This figure is 13 percent of the forest adminstered by the BLM and represents two percent of the total federal and Indian forest land. Exchanges would be emphasized over sales, therefore it is doubtful that the above figure would accurately reflect the loss of forest acreage from public ownership.

In the event the maximum amount of forest land (17,686 acres) is removed from public ownership, the Bureau's forestry program would not be impacted in the short or long term, since the Resource Area does not have an established allowable cut. However, the amount of forest resource available for incidental sales of firewood, Christmas trees, sawlogs and posts and poles would be reduced, perhaps significantly in some areas.

Approximately 5,433 acres of commercial and noncommerical forest land would become unavailable due to designation of Zook Creek and Buffalo Creek as wilderness. The impacts to the Bureau's forestry program would be insignificant, since the Resource Area does not have an established allowable cut. However, the amount of forest resource available for incidental sales of posts and poles would be reduced.

Summary

Cumulative impacts to the forest products industry would be insignificant. A small amount of public forest land would be lost or made unavailable due to coal mining, land and wilderness actions. There would be no impacts from vegetation utilization actions.

Agriculture

If all areas were mined, 1,000 acres of Class III to IV land currently being utilized as cropland would be affected. In addition, 20 acres of Class VI and VII land best suited for native grassland but currently utilized as cropland would be affected. Maximum annual loss during mining and reclamation would be approximately 27,336 bushels of winter wheat or 1,428 tons of alfalfa hay, if all cropland were mined at once. These losses would not have a significant effect on regional agricultural production; however, individual operators would be significantly impacted.

Annual soil disturbance from mining (600 to 1,000 acres) at current and projected rates of production would not exceed that acreage presently left bare annually due to summer fallow (2,000 to 2,500 acres) in the areas of coal with development potential. Preliminary indications from completed and ongoing reclamation research are that impacts after reclamation are not significant, since agricultural productivity of mined land can be restored (Gilley et al 1982, Pole et al 1979, Power et al 1981).

Vegetation utilization actions would have no impact on agriculture.

Sale or exchange of 164,723 acres could include some or all of the 637 acres of public land currently utilized as cropland and tame pasture. There are 14,619 acres in the short term and 51,064 acres in the long term that have potential to be plowed and are in land capability Class III and VI.

There would be no impacts to agriculture from wilderness actions, because there is no agricultural use in the WSAs.

Summary

The cumulative impact on regional agriculture would be insignificant. Land actions could have a beneficial impact on some individual operators. There would be an insignificant impact from coal mining actions and no impacts from vegetation utilization and wilderness actions.

Economics

This alternative does not consider the 1984 proposed lease sale. Consequently, the projections, as determined by the Casper District Office Input-Output Model will be the same as the no action alternative reported in the draft Powder River Coal EIS for the 1984 sale.

Table 4-20 indicates approximately a 3,100 increase by 1990 in total employment over 1980 figures for Big Horn, Powder River and Rosebud Counties. This increased projected employment would add approximately 10,800 population by 1990 to the three counties (see Table 4-21). In addition, Sheridan County, Wyoming, would increase by 1,900 due to Montana coal mining (See Table 4-22). Table 4-23 identifies projected population of the Indian reservations.

Tables 4-24, 4-25, 4-26 and 4-27 indicate the amount of community services that would be required to support the population increase as determined by the Casper District Office Input-Output Model for the short and long term.

Tables 4-28 and 4-29 display the projected revenues that would be required to meet projected expenditures. These projections are derived from the assumption that adequate services were being provided in 1980. Per capita costs for 1980 were used to project needs in 1990 and 1995. Indian tribes would probably require additional funds from Congress.

Coal development is projected to stabilize by approximately 1990 (short term). Figures portrayed for 1995 are the projections expected for the long term.

If all coal were mined over a 40-year period, a total of 39,391 acres would be disturbed. Of this total, approximately 1,000 acres of cropland would be disturbed.

The total 39,391 acres of rangeland would support 7,618 AUMs or 190 AUMs per year which would be lost due to mining. This is approximately 16 AUs at a value of $400 per head and would amount to $6,400 loss from rangeland per year. This loss to economic activity would be greatly surpassed by inputs from mining. Ranch owners would be compensated for this loss by mining companies.

The 1,000 total acres of cropland lost to mining averages approximately 25 acres lost per year. This acreage could produce 685 bushels of wheat or 35 tons of hay. The value lost each year would be $2,740 from wheat or $1,855 from hay using Montana Department of Agriculture prices for 1982. This again would be a very small loss to the economic activity of the region and would be surpassed by the increased economic activity from mining.

After reclamation, these lands would be returned to agricultural use at the same or greater levels than before mining.

This alternative would decrease livestock forage by 30,592 AUMs. These AUMs would be immediately available for wildlife, watershed protection and other nonconsumptive uses. This would cause an annual loss of $1,020,000 per year for the Resource Area from the sale of cattle.

This reduction of AUMs in the short term would result in a reduction of $3,000,000 in preference value. This would affect many ranchers when they apply for loans or attempt to sell their ranches.

In the long term, livestock AUMs would increase to 232,608 (a 55,117 AUM increase after the cut) and wildlife, watershed protection and other nonconsumptive uses would also increase by 46,886 AUMs.

The cost of implementing this alternative in the long term would be $6,465,960 or $6.93 per AUM.

The gain in livestock AUMs would increase production earnings by approximately $1.8 million per year.

Preference values in the long term would increase by $5,511,700, which would provide a greater loan value and would increase the value of ranches if sold.

Land disposal could affect county revenue because of differences in lieu of taxes (PILT) and county taxes. Impacts would be insignificant.

At Zook Creek there would be additional labor costs associated with the general prohibition of motor vehicle use for range development maintenance. Income to each of the three operators would decline about $200 per year.

The value of federal coal being mined in the vicinity is about 25 cents per ton to the federal government. This is calculated by discounting the federal bonus and royalty payments on $10 per ton coal. On this basis the value foregone of the 464 million tons of coal with development potential would be $166 million. However, because of large quantities of more desirable coal in the general area, this value is a comparatively small factor and may be overstated for revenues which could be generated at Zook Creek.

There is no economic value to the timber resource, as harvest costs would outweigh the timber revenues.

The value foregone for the 55 million tons of coal at Buffalo Creek is about $15 million.

Social Impacts

With this alternative, coal development would be inhibited and the social impacts would be greatest in the presently underdeveloped areas around Ashland, Otter Creek, and Birney. Broadus could also receive some impacts.

The Tongue River Railroad or some other form of transportation would have to be developed before the Ashland—Otter Creek—Birney area could be developed.

The opportunity for jobs for members of the Indian reservations would occur as additional mines are developed or as existing mines increase production.

Colstrip, Forsyth, Hardin and Sheridan could increase in population, but these communities should not be greatly impacted. Development would occur only when the market improves, which should allow time for people planning by communities.

It is likely that in the short term, the general social well being of ranchers who use BLM land for grazing would decrease, because some AUMs would be lost. In the long term, with reduced grazing, range conditions could improve so livestock use could improve from existing allotment levels. In the long term, there would be improved social well being to ranchers who use BLM land for grazing.

One social consideration has to do with futures foregone. Land use decisions not only affect present land use, but also help shape decisions that are possible for the future. Other things being equal, a decision that restricts future options is socially less desirable than one which leaves future choices open. In this context, land pattern and adjustment may be a more flexible approach in leaving future choices open than the other alternatives. Under this alternative, the total amount of acreage the Resource Area oversees would remain about the same. It is quite feasible as resources become more scarce that federal land will continue to increase in value, not only fiscally but as a recreational and social resource. The greater flexibility of this alternative is also a benefit in that it provides for substantial exchanges of lands to improve recreational and wildlife values and to consolidate for better management.

Sale as a method of land disposal may have more potential for negative distribution of impacts. If land adjacent to current operators is sold, even under modified bidding procedures, the operator may not be able to afford to purchase the land. BLM land sales would have more potential for negatively impacting the small rancher or those with heavy debt loads, than the larger, wealthier ranchers.

Exchange as a land disposal practice may have less liklihood of inequitable impacts. There is still the possibility that if land adjacent to current operators is exchanged to someone else, it may harm the operator's ranching operation. Three-way trades or land exchange pooling may somewhat mitigate this possibility. If exchanges are used to improve access to public land, regional recreational and hunting opportunities would be enhanced.

There would be minimal social impacts resulting from wilderness actions.

TABLE 4-20
PROJECTED TRENDS FOR COVERED EMPLOYMENT AND SALARIES AND WAGES IN BENCHMARK YEARS FOR THE NORTHERN POWDER RIVER REGION
(salaries and wages are in millions of dollars)

ALTERNATIVE D

	1980[1]		1990		1995	
County/Sector	Employment	Salaries and Wages	Employment	Salaries and Wages	Employment	Salaries and Wages
Big Horn County						
Coal employment[2]	954	26.8	2,240	63.1	2,240	63.1
Construction employment[3,4]	589	17.3	420	12.3	420	12.4
All other employment[3]	2,351	25.4	2,570	27.8	2,580	27.8
All covered employment	3,894	69.6	5,200	103.2	5,200	103.3
Powder River County						
Coal employment[2]	15	0.3	440	9.5	440	9.5
Construction employment[3,4]	33	0.5	40	0.5	40	0.5
All other employment[3]	529	5.8	580	6.3	590	6.4
All covered employment	577	6.6	1,100	16.3	1,100	16.4
Rosebud County						
Coal employment[2]	432	12.1	1,340	37.5	1,410	39.7
Construction employment[3,4]	707	14.9	820	17.3	810	17.1
All other employment[3]	2,337	23.3	2,690	26.8	2,700	26.9
All covered employment	3,476	50.3	4,800	81.6	4,900	83.7

NOTE: Totals may not agree due to rounding.

[1] The 1980 employment is the annual average of monthly employment covered by unemployment insurance, as reported for the county of employment. The 1980 salaries and wages are a summation of covered quarterly salaries and wages. Monthly and quarterly data for 1980 were furnished by the Employment Security Division of the Montana Department of Labor and Industry.

[2] Projections of coal employment are based on the relationship of one additional employee for each additional 25,300 tons of projected coal capacity (relationship derived from the Casper District input-output model). Salaries and wages for coal are based on the 1980 weekly average wage for mining.

[3] Projected secondary employment is estimated at one additional job in the region for each additional permanent job in energy and 0.5 additional job in the region for each temporary job (as derived from the Casper District input-output model). The secondary employment is then distributed among sectors on the basis of each sector's share of the ten-year (1970-1980) regional change in all employment less mining. The secondary sector change is then distributed to the counties on the basis of each county's share of the ten-year (1970-1980) change in regional employment in that sector. Salaries and wages are projected on the basis of 1980 average weekly wage.

[4] Construction projections include construction employment for mines, power plants, and railroads, as applicable, in addition to secondary construction employment. Construction estimates for major projects were obtained from industrial planning and environmental impact statements.

[5] Construction projections include construction employment for mines, power plants, and railroads, as applicable, in addition to secondary construction employment. Construction estimates for major projects were obtained from industrial planning and environmental impact statements.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 4-21
PROJECTED POPULATION TRENDS AND HOUSING NEEDS
(Totals may not agree due to rounding)

ALTERNATIVE D

	1980		1990		1995	
	Population	Housing	Population	Housing	Population	Housing
Big Horn County[1]	11,096	3,867	15,600	5,400	15,700	5,500
Crow Reservation Div.[2]	5,645	1,734	7,900	2,430	8,000	2,460
Hardin Division[2]	4,249	1,737	6,000	2,450	6,000	2,450
Hardin[2]	3,300	1,360	4,600	1,900	4,700	1,940
Northern Cheyenne Div.[2]	1,013	288	1,420	400	1,430	410
Tongue River Division[2]	189	108	270	150	270	150
Powder River County[3]	2,520	1,123	4,640	2,070	4,640	2,070
Broadus Division[2]	1,321	612	2,430	1,130	2,430	1,130
Broadus[2]	715	337	1,320	620	1,320	620
East Powder River Div.[2]	725	303	1,340	560	1,340	560
Otter Division[2]	474	208	870	380	870	380
Rosebud County[5]	9,899	3,787	14,500	5,500	14,700	5,600
Ashland Division[2,6]	564	248	830	370	840	370
Ashland[6]	415	128	610	190	620	190
Forsyth Division[2]	3,516	1,472	5,100	2,140	5,200	2,180
Forsyth[2]	2,553	1,053	3,700	1,530	3,800	570
Northern Cheyenne Div.[2]	2,651	758	3,900	1,120	4,000	1,140
Rosebud Division[2]	3,168	1,309	4,600	1,900	4,700	1,940
Colstrip[2]	1,476	475	2,160	700	2,200	710

NOTE: Housing needs based on 1980 ratio of persons per house.

[1] Trends were derived by applying 1980 population-to-employment ratios to projected employment. A ratio of 2:992 was used for permanent employment, plus 1:256 for temporary employment.

[2] Trends are based on the 1980 share of county population.

[3] Trends were derived by comparing 1980 population-to-employment ratios to projected employment. A ratio of 4:367 was used for permanent employment, plus 1:263 for temporary employment. As there was no apparent temporary population in Powder River County in 1980, the average of the temporary ratios for Rosebud and Big Horn Counties was used for Powder River County.

[4] The 1980 figures for Broadus are from the preliminary census releases.

[5] Trends were derived by comparing 1980 population-to-employment ratios to projected employment. A ratio of 2:997 was used for permanent employment, plus 1:270 for temporary employment.

[6] Not to be confused with the Ashland District of the Northern Cheyenne Reservation.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 4-22
PROJECTED POPULATION TRENDS AND HOUSING NEEDS FOR SHERIDAN COUNTY

ALTERNATIVE D

	1980		1990		1995	
	Population[1]	Housing[2]	Population[1]	Housing[2]	Population[1]	Housing[2]
Primary impact of Montana employment	1,410	626	3,300	1,440	3,330	1,440
Secondary impact of Montana impacts	190	80	800	350	820	360
Base without Montana Impacts[3]	23,500	10,300	28,500	12,400	29,300	12,800
County total	25,048	10,928	32,600	14,200	33,400	14,600
City of Sheridan	15,146	6,604	19,700	8,600	20,200	8,800

NOTE: Totals may not agree due to rounding.

[1] Projections of total Sheridan County population are based on the 1980 population-to-employment ratio of 2:8997 for permanent employment, plus 1:2085 for temporary employment. Estimates of primary and secondary impacts to Sheridan County due to Montana employment were made after the population-to-employment ratio was modified by alternately adding and subtracting Montana employment and its effects from Sheridan County employment and population in each projected year. City population is projected at its 1980 share (60.47%) of county population.

[2] Housing projections are based on the 1980 ratio of 2:292 persons per house for the county and 2:293 persons per house for the city.

[3] Base population and housing were derived by subtracting primary and secondary impacts from the total.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984.

TABLE 4-23
ESTIMATED POPULATION TRENDS AND HOUSING NEEDS FOR THE CROW AND NORTHERN CHEYENNE INDIAN RESERVATIONS

ALTERNATIVE D

	1980		1990		1995	
	Population	Housing	Population	Housing	Population	Housing
Crow Reservation						
Indian	3,953	801	5,400	1,090	5,500	1,110
NonIndian	2,020	1,038	1,430	2,770	2,810	1,440
Reservation total[1]	5,973	1,839	8,200	2,520	8,300	2,560
Lodge Grass	771	215	1,060	300	1,070	300
Northern Cheyenne Reservation						
Indian	3,101	718	4,500	1,040	4,600	1,070
NonIndian[1],[2]	563	328	810	470	830	480
Reservation total	3,664	1,046	5,300	1,510	5,400	1,540
Ashland (on reservation)[2]	380	110	540	160	560	160
Birney (on reservation)[2]	145	40	210	60	210	60
Busby[2]	810	230	1,170	330	1,190	340
Lame Deer[2]	2,000	570	2,890	820	2,950	840

NOTE: Totals may not agree due to rounding.

[1] Includes the portion of the Crow Reservation in Yellowstone County, Montana. This portion was held constant for the projection.

[2] Population figures for Ashland, Birney, Busby and Lame Deer were taken from a statement of the Northern Cheyenne Tribe at the EIS scoping meeting in Ashland, Montana, on May 26, 1983. Housing figures are based on the average number of persons per house for the Northern Cheyenne Reservation in 1980.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 4-24
ESTIMATED 1990 REQUIREMENTS FOR COMMUNITY SERVICES (SHORT TERM)
(based on 1979-1980 levels per 1,000 population)

ALTERNATIVE D

County/ Community	School Enrollment	Water Capacity (million gallons/day)	Sewage Capacity (million gallons/day)	Law Enforcement (sworn officers)	Firefighters		Hospital Beds
					Fulltime	Volunteers	
Big Horn	3,360	—	—	22	—	32	70
Hardin	—	5.6	(1)	(2)	—	28	—
Powder River	1,070	—	—	7	—	28	19[3]
Broadus	—	0.9	(4)	(2)	—	(5)	—
Rosebud	3,710	—	—	28	—	—	38
Ashland	—	(6)	(6)	(2)	—	4[7]	—
Colstrip	—	(8)	(8)	(2)	—	40	—
Forsyth	—	5.1	0.7	(2)	—	23	—

[1] Hardin has sewage treatment capacity to serve a population of 6,000.

[2] It is assumed that the county can continue to provide adequate law enforcement service.

[3] Based on regional average of four beds per 1,000 population.

[4] On the basis of usage in 1979-1980, it is assumed that the present three-cell, 7.72-acre lagoon would be utilized at less than 2/3 of capacity.

[5] It is assumed that the county can continue to provide adequate volunteer fire-fighting service.

[6] Ashland has water and sewage capacity to serve a population of 2,500.

[7] Based on regional community average of six volunteers per 1,000 population.

[8] Colstrip has water capacity to serve a population of 7,200 and sewage capacity to serve 7,500.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 4-25
ESTIMATED 1990 REQUIREMENTS (SHORT TERM) FOR THE CROW A NORTHERN CHEYENNE INDIAN RESERVATIONS

(based on 1979-80 levels per 1,000 population)

ALTERNATIVE D

County/ Community	School Enrollment	Water Capacity (million gallons/day)	Sewage Capacity (million gallons/day)	Law Enforcement (sworn officers)	Firefighters		Hospital Beds
					Fulltime	Volunteers	
Crow Reservation	(1)	—	—	21	8[2]	—	—
Crow Agency	(1)	1,200	23	16	—	14	47
Lodge Grass	(1)	380	16	3	—	14	—
Northern Cheyenne Reservation	(1)	—	—	22	9[6]	—	21[3]
Ashland (on reservation)	600	100	6	1[4]	—	3[5]	—
Birney (on reservation)	(1)	100	3	0[4]	—	1[5]	—
Busby	320	210	4	2[4]	—	7[5]	—
Lame Deer	(1)	520	14	4[4]	—	17[5]	—

NOTE: Based on 1979-1980 levels per 1,000 population where existing; otherwise based on standards footnoted.

[1] Public schools are operated by the county. Enrollment levels for Big Horn and Rosebud Counties are presented in Table 4-26.

[2] Part-time firefighters employed by the Bureau of Indian Affairs, U.S. Department of the Interior.

[3] Based on a regional average of four beds per 1,000 population.

[4] Based on a regional average of 1.4 officers per 1,000 population.

[5] Based on a regional average of six volunteers per 1,000 population.

[6] In addition, there is a seven member forest crew during the summer.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 4-26
ESTIMATED 1995 REQUIREMENTS FOR COMUNITY SERVICES (LONG TERM)
(based on 1979-1980 levels per 1,000 population)

ALTERNATIVE D

County/ Community	School Enrollment	Water Capacity (million gallons/day)	Sewage Capacity (million gallons/day)	Law Enforcement (sworn officers)	Firefighters Volunteers	Hospital Beds
Big Horn	3,390	—	—	23	33	71
Hardin	—	5.7	(1)	(2)	28	—
Powder River	1,070	—	—	7	28	19[3]
Broadus	—	0.9	(4)	(2)	(5)	—
Rosebud	3,770	—	—	28	—	39
Ashland	—	(6)	(6)	(2)	4[7]	—
Colstrip	—	(8)	(7)	(2)	40	—
Forsyth	—	5.2	0.7	(2)	24	—

[1] Hardin has sewage treatment capacity to serve a population of 6,000.

[2] It is assumed that the county can continue to provide adequate law enforcement service.

[3] Based on regional average of four beds per 1,000 population.

[4] On the basis of usage in 1979-1980, it is assumed that the present three-cell, 7.72-acre lagoon would be utilized at less than 2/3 of capacity.

[5] It is assumed that the county can continue to provide adequate volunteer firefighting service.

[6] Ashland has water and sewage capacity to serve a population of 2,500.

[7] Based on regional community average of six volunteers per 1,000 population.

[8] Colstrip has water capacity to serve a population of 7,200 and sewage capacity to serve 7,500.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 4-27
ESTIMATED 1995 REQUIREMENTS (LONG TERM) FOR THE CROW AND NORTHERN CHEYENNE INDIAN RESERVATIONS
(based on 1979-80 levels per 1,000 population)

ALTERNATIVE D

County/ Community	School Enrollment	Water Capacity (million gallons/day)	Sewage Capacity (million gallons/day)	Law Enforcement (sworn officers)	Firefighters		Hospital Beds
					Fulltime	Volunteers	
Crow Reservation	(1)	—	—	21	8[2]	—	—
Crow Agency	(1)	1,200	23	16	—	14	47
Lodge Grass	(1)	380	16	3	—	14	—
Northern Cheyenne Reservation	(1)	—	—	22	9[6]	—	21[3]
Ashland (on reservation)	600	100	6	1[4]	—	3[5]	—
Birney (on reservation)	(1)	100	3	0[4]	—	1[5]	—
Busby	320	210	4	2[4]	—	7[5]	—
Lame Deer	(1)	520	14	4[4]	—	17[5]	—

NOTE: Based on 1979-1980 levels per 1,000 population where existing; otherwise based on standards footnoted.

[1] Public schools are operated by the county. Enrollment levels for Big Horn and Rosebud Counties are presented in Table 4-26.

[2] Part-time firefighters employed by the Bureau of Indian Affairs, U.S. Department of the Interior.

[3] Based on a regional average of four beds per 1,000 population.

[4] Based on a regional average of 1.4 officers per 1,000 population.

[5] Based on a regional average of six volunteers per 1,000 population.

[6] In addition, there is a seven member forest crew during the summer.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 4-28
PROJECTED REVENUES COMPARED TO PEAK EXPENDITURES
(in thousands of dollars, rounded to the nearest $100,000)

ALTERNATIVE D

	1990	1995
Big Horn County		
Revenues	8,600	8,600
Expenditures	8,600	8,600
Big Horn County Schools		
Revenues	13,900	13,900
Expenditures	13,900	13,900
Hardin		
Revenues	1,100	1,100
Expenditures	1,100	1,100
Powder River County		
Revenues	7,200	7,200
Expenditures	7,200	7,200
Powder River County Schools		
Revenues	3,700	3,700
Expenditures	3,700	3,700
Broadus		
Revenues	300	300
Expenditures	300	300
Rosebud County		
Revenues	9,400	9,400
Expenditures	9,400	9,400
Rosebud County Schools		
Revenues	8,700	8,700
Expenditures	8,700	8,700
Ashland		
Revenues	210	210
Expenditures	210	210
Colstrip		
Revenues	7,000	7,000
Expenditures	7,000	7,000
Forsyth		
Revenues	1,900	1,900
Expenditures	1,900	1,900

NOTE: Debt servicing is included.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

TABLE 4-29
PROJECTED REVENUES COMPARED TO PEAK EXPENDITURES
(in thousands of dollars, rounded to the nearest $ 100,000)

ALTERNATIVE D

	1990	1995
Crow Reservation		
Revenues (1990)[1]	8,900	8,900
Expenditures (1990)[2]	8,900	8,900
Lodge Grass		
Revenues (1990)[1]	120	120
Expenditures[2]	120	120
Northern Cheyenne Reservation		
Revenues (1990)[1]	6,100	6,100
Expenditures (1990)[2]	6,100	6,100

[1] Revenues are not expected to increase, as the reservations are not expected to benefit from gross proceeds or property taxes.

[2] Expenditures are projected on the basis of 1980 per capita expenditure levels.

Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, Jan. 1984

CHAPTER 5

CONSULTATION AND COORDINATION

PREPARATION

The Powder River RMP was prepared by specialists from the Miles City District Office, with assistance and guidance from the Montana BLM State Office. Disciplines and skills used to develop this RMP were: vegetation and rangeland use, geology, hydrology, climate, recreation, soils, cultural resources, realty, paleontology, recreation, sociology, economics, wildlife, fisheries, agronomy, graphics, animal science, forestry, editing, printing, public affairs, and typing. Preparation of this RMP began in 1980 with public scoping meetings held in Miles City, Hysham, Birney, Sheridan, Wyoming, Broadus and Ekalaka. There was also an interagency coordination meeting held in Miles City. Coordination and consultation meetings were also held with the Northern Cheyenne and Crow Indian tribes. In all, three informational and input gathering brochures were mailed while the RMP was in development. See Appendix C.

PUBLIC PARTICIPATION

Area newspapers and the Federal Register were also used as means to keep the public informed of the RMP development. One step in the process was consultation by letter with all of the approximately 450 surface owners over areas of federal coal with development potential in the Resource Area, one of four planning screens applied to this public resource.

Public participation included requests for public input in the formulation of issues, criteria, initial alternatives and adoption of preferred alternatives. Mailings included addresses of those known to have been interested in the Powder River Resource Area previously as well as a mass mailing to over 4,000 mail box holders in the Resource Area.

This RMP is being mailed to about 980 addressees known to have expressed an interest in it.

AGENCIES AND ORGANIZATIONS CONSULTED

The Powder River RMP team consulted and/or received comments from the following organizations and agencies during the preparation of the document:

- American Mining Congress
- Audubon Society
- Montana Association of State Grazing Districts
- National Association of Counties
- Montana Association of Conservation Districts
- League of Women Voters
- Roosevelt Custer R C & D
- Northern Plains Resource Council
- Montana Coal Council
- Natural Resources Defense Council
- Powder River Basin Resource Council
- Montana Public Lands Council
- Sheridan County Chamber of Commerce
- Sierra Club
- Wilderness Society
- National Wildlife Federation
- Wildlife Management Institute
- Wildlife Society

Local, State and National Government Elected Officials

U.S. Senator Max Baucus
Mayor, Town of Broadus
Mayor, Town of Ekakala
Mayor, City of Forsyth
Mayor, Town of Hysham
Congressman Ron Marlenee
U.S. Senator John Melcher
Mayor, City of Miles City
Montana Representative Carl Zabrocki
Montana Representative Tom Asay
Congressman Pat Williams

Federal Agencies

Buffalo (Wyoming) Resource Area, Bureau of Land Management
Bureau of Indian Affairs
U.S. Air Force Civil Engineering
Bureau of Reclamation
Soil Conservation Service
Agricultural Stabilization & Conservation Service
U.S. Army Corps of Engineers
Environmental Protection Agency
Custer National Forest
U.S. Fish & Wildlife Service
U.S. Geological Survey
U.S.Geological Survey—Water Resources Division
Office of Surface Mining Reclamation and Enforcement
Indian Health Service

State and Local Government

- Commissioners, Conservation Districts, Planning Boards
  - Big Horn County
  - Carter County
  - Custer County
  - Powder River County
  - Rosebud County
  - Treasure County
  - Sheridan County (Wyoming)
- Custer County ASC Commmitte
- Great Falls City—County Planning Board
- Montana, State of
  - Water Quality Bureau
  - Environmental Quality Bureau
  - Department of Agriculture
  - Department of Commerce
  - Department of Fish, Wildlife & Parks
  - Department of Health & Environmental Sciences
  - Bureau of Mines & Geology
  - Office of Historic Preservation
  - Department of State Lands
  - Department of Natural Resources
- Powder River County Agent
- Rosebud and Treasure Counties Agent

Indian Tribes

Crow Tribal Chairman Donald Stewart
Crow Tribe Division of Natural Resources
Crow Tribe Land & Resources Committee
Northern Cheyenne Tribal President Allan Rowland
Northern Cheyenne Tribal Environmental Affairs
Northern Cheyenne Tribal Planning Office

Individuals

Individual livestock grazing operators, area schools, libraries and many individuals were contacted for views on the Powder River planning and resources.

LIST OF PREPARERS

The following people prepared the RMP:

Steering Committee

Robert Teegarden, Chairman

BS Natural Sciences, Montana State University. He provided District policy and oversight to the RMP project. He has been with the BLM for 22 years.

Larry Pointer, MSO Coordinator

BS Genetics, Iowa State University; MS Agronomy and Plant Genetics, University of Minnesota; MA Librarianship, and University of Denver. He represented the Montana State office and provided headquarters policy, oversight and coordination to the RMP project. He has been with the BLM eight years.

Alan Pierson, Powder River Resource Area Manager

BS Wildlife & Range Management, New Mexico State University. He provided Resource Area policy and oversight to the RMP project. He has been with with BLM for six years.

Project Team

Jay Guerin, Project Manager

BS Journalism, University of Wyoming. He was responsible for the overall development and coordination of the RMP project and also served as team leader. He has been with BLM for five years.

Dave Wessman, Technical Coordinator

BS Forest Watershed Management, Utah State University. He was responsible for the coordination of schedules and accuracy of technical information. He was also responsible for the graphic displays and coordination with MSO. He has been with BLM for five years.

Ed Heffern, Coal Issue Leader

BS and MS Geology, Stanford University. He developed and wrote the coal, geology, topography and other minerals sections of the RMP. He has been with BLM for four years.

Fred Wambolt, Vegetation Allocation Issue Leader

BS Agriculture Production, Montana State University, AA Miles Community College. Fred developed and wrote the vegetation and livestock sections of the RMP. He has been with BLM for five years.

Chris Roholt, Wilderness Issue Leader

BS Mathematics and Economics, MS Forestry/Economics, University of Montana. He developed and wrote the wilderness sections. He has been with BLM five years.

Gaylon Wilcox, Lands Issue Leader

Attended Mendocino Community College, Flathead Community College and Miles Community College with emphasis on business, real estate, physical science and forestry. He developed and wrote all of the lands sections. He has been with the BLM six years.

Joe Frazier, Hydrologist

BS Business Administration, University of Kansas, MS Aquatic Biology, Emporia State University, MS Hydrology, University of Wyoming. He prepared the hydrology portion of the RMP. He has been with the BLM three years.

Amy Fraley, Soil Conservationist

BS Resource Management, University of Wisconsin at Stevens Point. She wrote the soils portion of this RMP. She has been with BLM three years.

Les Dobson, Hydrologist

BS Watershed Science, Colorado State University. He wrote the air quality portion of the RMP and assisted in applying the hydrologic unsuitability criteria to coal areas. He has been with BLM two years.

Hank McNeel, Agronomist

BS General Agriculture, Colorado State University, MS and work toward PhD Agronomy (Weed Science), University of Idaho. Hank wrote the agricultural sections of the RMP. He has been with BLM five years.

B.J. Earle, Archaeologist

BA and graduate work Archaeology, Brigham Young University. She prepared the cultural resource and historical sections of the RMP. She has been with BLM for eight years.

Mark Gorges, Wildlife Management Biologist

BS Biology, Manhattan College, BS and MS Fish & Wildlife Management, Montana State University. He wrote the wildlife sections of the RMP. He has been with BLM four years.

Susan L. Davidson, Sociologist

BS Sociology, University of Wisconsin at Madison, MA Sociology, Colorado State University. She wrote the social impact assessments of the RMP. She was with the BLM one year.

Dave Peters, Regional Economist

BA Economics/Business Administration, Chapman College. He wrote the economics sections of the RMP. He has been with BLM nine years.

Harold C. Vosen, Range Management

BS Forest Management, University of Idaho. He worked on the vegetation inventory, computer analysis and allotment categorization. He has been with BLM 21 years.

Dale Hanson, Range Conservationist

BS Wildlife Science, New Mexico State University. He wrote the paleontologic portions of the RMP. He worked on the vegetation inventory and allotment categorization. He has been with BLM six years.

William Schurger, Realty Specialist

BS Forestry, University of Montana. He wrote the forestry portion of the RMP. He has been with BLM four years.

Vern Taylor, Supervisory Range Conservationist

BA Animal Husbandry, MA in Range Management and Animal Nutrition, Montana State University. He prepared the range management portion of the RMP. Vern has been with the BLM for 21 years.

Paul Cepulis, Geologist

BS Geology, Utah State University. He prepared the maps for mineral portions of the RMP. He has been with BLM one year.

Kenneth Hanify, Natural Resource Specialist

BS Science and Industrial Arts, South Dakota State University, and MA Biology, Northern Arizona University. He wrote the section on recreation in the RMP. He has been with BLM five years.

Gordon Cormier, Geologist

BS Geology and Range, Montana State University. He worked on the oil and gas and locatable minerals portions of the RMP. He has been with BLM for seven years.

James Hetzer, Writer/Editor

BA Journalism, University of Colorado. He wrote portions, edited and assisted with layout of the RMP. He has been with the BLM four years.

Rebecca A. Holzheimer, Cartographic Technician

Graduated from Simms (MT) High School. She prepared the allotment overlay for the RMP. She has been with BLM four years.

Kathy Bockness, Lead Clerk-Typist

Graduated from Sacred Heart High School, attended Miles Community College. She was responsible for the copy word processing and coding of the RMP. She has been with BLM two years.

Gloria Gunther, Clerk-Typist

Graduated from Custer County High School. She helped prepare word processing and coded copy for the RMP. She has been with BLM three years.

Barbara Hamburg, Clerk-Typist

Graduated from Savage (MT) High School and Modern Business College, Missoula, Montana. Helped prepared word processing for the RMP. She has been with BLM for one year.

District Review

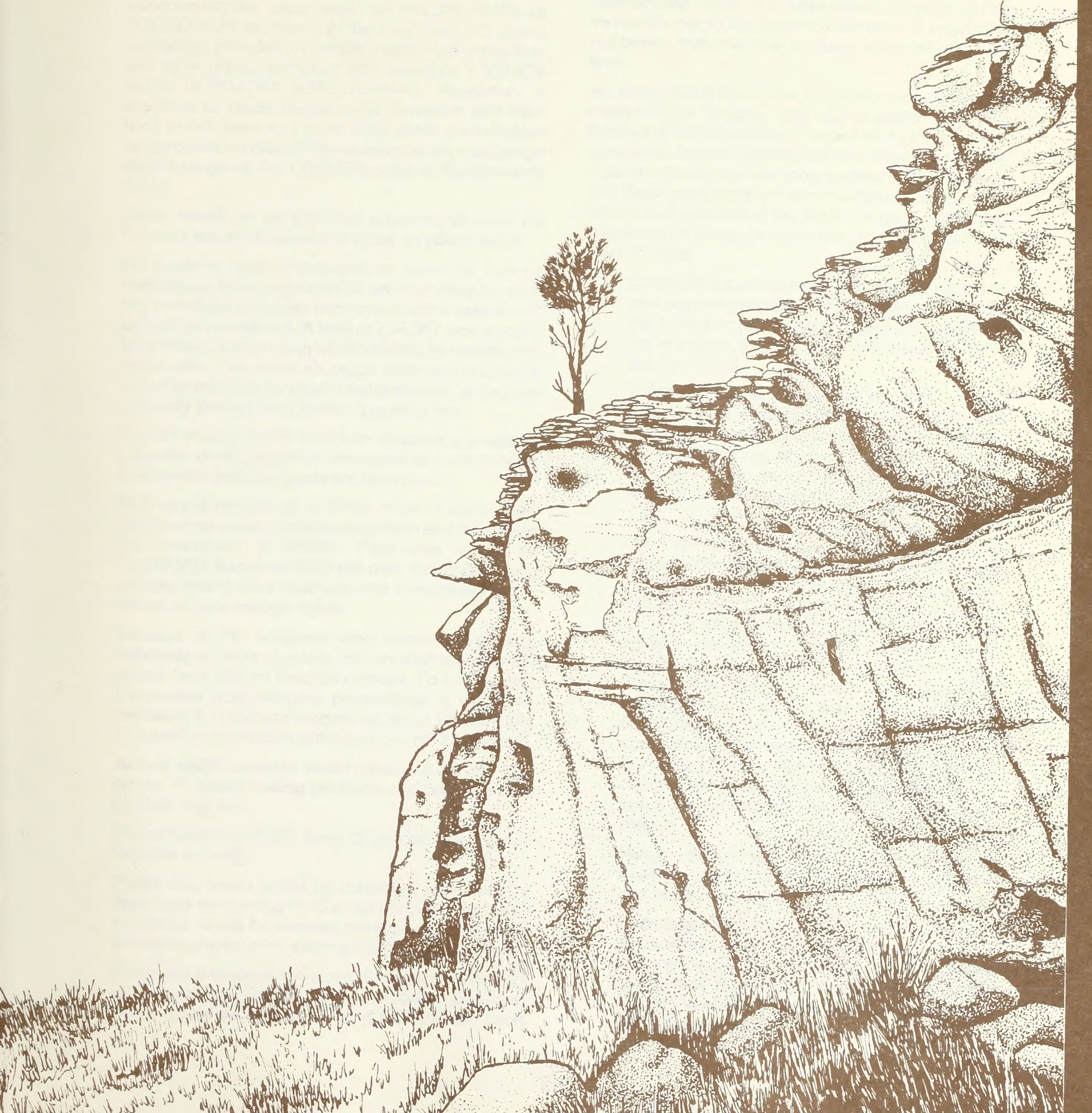
The Miles City District Division of Lands and Renewable Resources and the Planning and Environmental Assistance Staff provided Technical Review of the RMP.

Montana State Office Support

The Minerals Evaluation Branch developed maps depicting coal areas with development potential.

The Printing and Graphics Branch provided mapping, art and printing support.

APPENDICES



APPENDIX A

NO GRAZING ALTERNATIVE AND ENVIRONMENTAL CONSEQUENCES

No Grazing Alternative

No livestock would be permitted to graze on public lands. Therefore there would be no AUMs permitted for livestock use. In the short term (5 years) vegetation allocation for wildlife, watershed protection and other nonconsumptive uses would be 832,332 AUMs (a 208,083 AUM increase). In the long term (15 years) vegetation provided to wildlife, watershed protection and other nonconsumptive uses would be 1,332,876 AUMs (a 500,544 AUMs increase). Vegetation is expected to reach climax range condition and then tend to drift back to a lower level within the excellent range condition class. This would occur on most range sites throughout the 1,080,675 acres in the Resource Area.

There would not be allotment adjustments since no livestock would be allowed to graze on public lands.

No livestock range improvements would be built or maintained. Improvements that are important for wildlife, watershed and other non consumptive uses would be built or maintained. A total of 234,367 acres would be suitable for improving wildlife habitat by mechanical treatments. Few livestock range improvement funds would be available for range improvements, as they are generally derived from livestock grazing fees.

The 27 existing AMPs would be dropped and activity plans for wildlife would be developed on a site specific to areawide basis as needs are identified.

BLM would remove up to 5,065 miles of interior livestock fences in lieu of maintaining them and to facilitate the movement of wildlife. Total cost would be $2,532,500, based on $500 per mile. Existing grazing permits would allow ranchers who contributed to the fences to have salvage rights.

Because of the scattered land ownership pattern, hundreds of tracts of public land are interspersed with private land with no boundary fences. To fully protect themselves from trespass proceedings, it would be necessary for ranchers to construct about 10,130 miles of boundary fence at an estimated cost of $28,366,800.

Annual wildlife projects would consist of 20 bird nest boxes, 10 goose nesting platforms and two reservoirs stocked with fish.

The condition of 5,000 acres of riparian areas would improve naturally.

Prairie dog towns would be controlled on a case-by-case basis amounting to 40 acres per year. The towns controlled would be selected because of soil erosion, watershed depletion or a threat to adjacent landowners.

An annual average of 130 acres of noxious weeds such as leafy spurge, Canada thistle, cocklebur and knapweed, would be controlled on a case-by-case basis. Biological control would be considered if proven effective. Precautions would be taken with the use of pesticides around water sources and crucial wildlife habitat.

Where vegetative cover is stagnant, prescribed burning averaging 20 acres annually would be allowed on a case-by-case basis. Fire suppression forces would be increased due to the expected increase of vegetation not being consumed that would be susceptible to wildfires.

An inspection is done prior to the approval of all range improvement projects that are implemented. This involves an interdisciplinary inspection by the resource specialists. Recommendations and mitigations are discussed in the field to overcome problems that may exist and these considerations are then taken into account before final approval of the project is given. Mitigating measures for resource protection on project development include;

> Soils—Soil specialists identify various chemical and physical properties of the soils in relation to the type of project being proposed. If the soils are not adequate, it would be recommended that the site be moved.
>
> Culural—Cultural specialists conduct ground inventories to determine if any sites are present which might be eligible for the National Register of Historic Places; when such sites are located, mitigation measures can include avoidance, data retrieval and recordation or preservation.
>
> As part of the design and construction of improvements, Federal regulations (36 CFR 800) require consideration of the effects of a Federal undertaking on sites eligible to the National Register of Historic Places. Determinations of eligibility to the Register and evaluations of effect are made in consultation with the Advisory Council on Historic Preservation and the State Historic Preservation Officer. Protective measures for register eligible sites can include avoidance, mitigation through data retrieval, and preservation. If sites which do not meet the criteria for eligibility to the register cannot be avoided, they may be affected or lost during ground disturbance, but would have previously yielded all available information.
>
> Range—Range specialists identify the proper location for the project and analyze the vegetative and livestock impacts.
>
> Hydrology—Impacts to current and future water users which could be affected by water-related projects would be addressed before project approval. If downstream water users or water quantity would be affected, alternate project sites would be selected.

Wildlife—Wildlife specialists identify the presence of threatened and endangered species, the location of important wildlife habitat areas in relation to the project site, and consider the time of year of construction in relation to the type of wildlife in the area. Adjustments are made considering wildlife values.

Environmental Consequences

Coal

There would be no impacts on coal resources.

Other Minerals

There wold be no impacts on other mineral resources.

Range

Current livestock grazing use would be eliminated. Vegetation provided to wildlife, watershed and other non consumptive uses would be 832,332 AUMs, a 33% increase. This increase in AUMs is based on potential soil productivity. Range condition would be expected to improve by 30%.

Development of structural improvements for wildlife and watershed resources would reduce vegetation production in the immediate area at the rate of 20 AUMs per acre in the short term, depending upon the type of improvement. There would be no long term impacts.

The overall effect of the proper application of mechanical treatment on 234,367 acres, if it were to occur, would be an improvement of range condition and a 100% increase in vegetation production on the treated lands.

The installing bird nest boxes and goose nesting platforms, stocking the two reservoirs that would be stocked with fish, and removing of 5,065 miles of interior fence, would have no significant impacts on vegetation production.

Elimination of livestock use in riparian areas would result in increased cover, plant community structure and health.

Control of prairie dog towns on up to 40 acres on a case-by-case basis, would result in a 100% increase in vegetation production because of improved plant vigor and the transition of the plant community from low to high producing species. Increased vegetation, shade and litter would increase site moisture retention and improve plant growth conditions.

Control of 130 acres of noxious weeds would result in up to a 200% increase in range condition through increases in desirable plant species, useful vegetative production and improved soil protection.

The short term effect of prescribed burning would be a loss of all forage being produced on the site. The long-term effect would be an increase in more desirable forage and cover. The short term effect of wildfires would be a loss of all forage being produced on the site. The long-term effect may or may not be an increase in more desirable forage and cover.

Increased fire hazard from increased fuels on public lands would increase the BLM cost for fire suppression activities on public lands and adjacent private land.

Elimination of livestock grazing would bring about a rapid short-term improvement in plant vigor and vegetative cover. Range condition would improve as succession to climax progressed with the more hardy grazing resistant plant species giving way to less hardy climax species.

Without the stimulation of livestock grazing, plant vigor and production would level off and stagnate on most soils in the long term.

Livestock

The elimination of livestock grazing on public lands would cause a reduction of livestock production on ranches associated with public land grazing. Forage lost would amount to 208,083 AUMs. The loss of grazing would reduce animal production on private and state lands, too, as livestock would have to trail to make use of the scattered private and state holdings. Excluding livestock from water, forage and shade areas on public lands would result in stress and lower weight gains.

BLM's range administrative workload would be expected to double because of livestock trespass detection and abatement activities required to protect public resources, unless boundary fences were constructed.

Hydrology

As 1,080,675 acres of public land would increase to excellent range condition after a number of years, watershed condition would consequently improve with a reduction in sediment and water yields of 1,339 ac ft/yr and 35,459 ac ft/yra respectively, a significant reduction. Mechanical treatment, prairie dog and noxious weed control, and prescribed burns would all contribute in achieving the improvement in range condition. Surface water quality would improve with the elimination of livestock using water sources on public land.

Soils

This alternative would improve range condition on 1,085,675 acres of public land in the long term. Vegetation production would increase, establishing optimum groundcover levels that would protect the soil from wind and water erosion.

Water developments and mechanical treatments would have insignificant impacts in the long term.

Prairie dog control on 40 acres annually would increase vegetation cover 100% in the long term and reduce runoff and erosion.

Noxious weed control on 130 acres annually would initially kill most of the vegetation, leaving dead plant residue that would help control wind and water erosion that could occur. In the long term, the treated areas would have up to a 200% increase in range condition through an increase of desirable plant species, minimizing erosion hazards.

Prescribed burning on 20 acres annually and fire suppression would remove most vegetation, leaving only plant residue in the short term. This would increase the available plant nutrients in the soil, but also cause accelerated erosion and the loss of organic matter. In the long term, there would be a 50-70% increase of vegetation production over the current production level, which would minimize erosion hazards and offset the short term soil losses.

Wildlife

Vegetation availability of 832,332 AUMs in the short term and 1,332,876 AUMs in the long term for wildlife and non consumptive uses would be very beneficial to wildlife. The removal of livestock would result in an increase in residual vegetation available as food and cover for all wildlife species and as ground cover for soil and watershed protection.

The quality and quantity of forage, especially forbs and browse, would improve; deer, antelope, bighorn sheep and game birds would benefit. Upland game birds require residual vegetation for nesting and winter survival.

Additional residual vegetation and greater vegetative production would help upland nesting waterfowl. Residual vegetation for nesting and brood rearing would be available near reservoirs. The quality and quantity of nongame forage and cover would increase.

There would be beneficial impacts to wildlife habitat from mechanical treatments because this management technique would be used only to improve wildlife habitat or to stabilize soils.

Development of activity plans for wildlife would be a major benefit to the BLM's wildlife management program because those plans would provide for consistent management policies in specific areas and not be concerned with livestock use.

Maintaining all water developments that are important for wildlife watering and maintaining reservoirs and pits that provide wetland habitat for waterfowl would have significant beneficial impacts on wildlife.

The continued construction and placement of an average of 20 bird nest boxes and 10 goose nesting platforms annually would benefit mainly waterfowl, kestrels and bluebirds.

The continued stocking or restocking of gamefish in two stockponds annually would benefit the general public by maintaining good fisheries.

Maintaining or improving woody riparian reproduction would provide 30% or more of the woody species as saplings or younger trees. This would assure continued age class diversity in the system and would assure the availability of browse for use by wildlife through winter months.

Any control of prairie dogs would further reduce the known prairie dog habitat. There is concern that as this natural habitat is further reduced, the prairie dog and associated species would reach dangerously low population levels, locally as well as regionally.

The treatment of 130 acres of noxious weeds, particularly Canada thistle, would reduce the available food for seed-eating birds. The small acreage treated would have minor impacts on wildlife.

Implementing prescribed burn plans and modified fire suppression plans would eliminate some dense vegetation. Although some wildlife species do require dense trees or shrubs, extensive areas of dense vegetation could be of greater value to wildlife if it were thinned with scattered openings.

There would be no significant impacts on threatened or endangered species. Each habitat improvement project would be surveyed for the occurrence of threatened or endangered species; recommendations would be made for appropriate mitigation or project stipulations. Any control of prairie dogs would decrease the potential habitat for black-footed ferrets.

The 10,130 miles of fence constructed to isolate the federal land would be a significant barrier to big game movement in wintering and concentration areas. Removal of 5,065 miles of interior fence would be a significant reduction in current restricted wildlife movement. The net effect of the two completed actions would double the current barrier to big game movement.

Cultural Resources

There would be no impacts on cultural resources.

Paleontology

There would be no impacts on the paleontologic resources.

Wilderness

There would be no impacts on wilderness characteristics in Zook Creek and Buffalo Creek WSAs.

Lands

Opportunities for land transactions would be significantly improved since the duration of a grazing lease or permit and private investments for range improvements on federal land would not have to be considered or compensated. In addition, the prohibition on grazing the public lands could be a motivating factor for increased land sales and exchanges with area ranchers.

Recreation

There would be no impacts from new range improvements, maintaining the woody riparian areas, control of prairie dogs and noxious weeds or prescribed burning. The mechanical treatment of 234,367 acres would result in a short term reduction in hunting habitat, which would be an insignificant impact in the long term.

Fencing off public land would help to eliminate many of the landowner-hunter conflicts over boundary recognition.

No grazing would have a significant positive impact on recreation by increasing wildlife numbers and improving hunting opportunities.

Air Quality

There would be no impacts on air quality.

Forestry

There would be a significant beneficial impact to the young trees and seedlings because the livestock would not be present to damage them.

Agriculture

There would be no impacts on agriculture.

Economics

The loss to the livestock industry from the loss of grazing on public lands would be $6.9 million per year (208,083 AUMs/12 months x $400 value per AU + $6,936,100). This loss of revenue would affect all other sectors of the economy in the Resource Area.

If ranchers cut their livestock use by 208,083 AUMs, the counties would have a reduction in tax revenues which could lead to increased taxes.

Many ranches raise adequate hay to support their present herds through the winter. With a reduction in herd sizes, the demand for hay would decrease which could lower the price received for hay.

Because of the increase in AUMs provided to wildlife, watershed protection and other nonconsumptive uses, wildlife numbers would increase, current high big game populations do economically impact many ranchers. Damage by increased numbers of wildlife would cause ranchers some problems.

The removal of interior fences by the BLM would cost the taxpayers approximately $2,532,500. In addition, $28,366,800 would be expended by ranchers for 10,130 miles of fence to fully protect themselves from trespass proceedings. This additional fencing could interfere with ranch management.

The BLM would have to increase budgets to support the administrative workload which would drastically increase because of livestock trespass abatement.

Social Impacts

The short-term and long-term losses to ranchers could cause many ranchers to go out of business. The loss of income to the livestock sector could also affect the profitability of other small businesses that are supported by the livestock industry. The additional expense of ranchers having to fence out public lands could also cause many ranchers to go broke.

This loss of income and additional expense would cause undue stress to people involved in ranching, especially at today's low return from cattle.

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management

____
(Serial Number)

APPENDIX B

OIL AND GAS LEASE STIPULATIONS

CULTURAL AND PALEONTOLOGICAL RESOURCES—The Federal Surface Management Agency (SMA) is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator, unless notified to the contrary by the SMA, shall:

1. Contact the appropriate SMA to determine if a site specific cultural resource inventory is required. If an inventory is required, then;
2. Engage the services of a cultural resource specialist acceptable to the SMA to conduct a cultural resource inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the area of proposed disturbance to cover possible site relocation which may result from environmental or other considerations. An acceptable inventory report is to be submitted to the SMA for review and approval no later than that time when an otherwise complete application for approval of drilling or subsequent surface disturbing operation is submitted.
3. Implement mitigation measures required by the SMA. Mitigation may include the relocation of proposed lease-related activities or other protective measures such as testing salvage and recordation. Where impacts to cultural resources cannot be mitigated to the satisfaction of the SMA, surface occupancy on that area must be prohibited.

The lessee or operator shall immediately bring to the attention of the SMA any cultural or paleontological resources discovered as a result of approved operations under this lease, and not disturb such discoveries until directed to proceed by the SMA.

ENDANGERED OR THREATENED SPECIES—The SMA is responsible for assuring that the leased land is examined prior to undertaking any surface-disturbing activities to determine effects upon any plant or animal species, listed or proposed for listing as endangered or threatened, or their habitats. The findings of this examination may result in some restrictions to the operator's plans or even disallow use and occupancy that would be in violation of the Endangered Species Act of 1973 by detrimentally affecting endangered or threatened species or their habitats.

The lessee/operator may, unless notified by the authorized officer of the SMA that the examination is not necessary, conduct the examination on the leased lands at his discretion and cost. This examination must be done by or under the supervision of a qualified resources specialist approved by the SMA. An acceptable report must be provided to the SMA identifying the anticipated effects of a proposed action on endangered or threatened species or their habitats.

ESTHETICS—To maintain esthetic values, all surface-disturbing activities, semipermanent and permanent facilities may require special design including location, painting and camouflage to blend with the natural surroundings and meet the intent of the visual quality objectives of the SMA.

EROSION CONTROL—Surface disturbing activities may be prohibited during muddy and/or wet soil periods. This limitation does not apply to operation and maintenance of producing wells using authorized roads.

CONTROLLED OR LIMITED SURFACE USE STIPULATION—This stipulation may be modified by special stipulations which are hereto attached or when specifically approved in writing by the Bureau of Land Management with concurrence of the SMA. Distances and/or time periods may be made less restrictive depending on the actual onground conditions. The prospective lessee should contact the SMA for more specific locations and information regarding the restrictive nature of this stipulation.

(Continued on Reverse)

The lessee/operator is given notice that the lands within this lease may include special areas and that such areas may contain special values, may be needed for special purposes, or may require special attention to prevent damage to surface and/or other resources. Possible special areas are identified below. Any surface use or occupancy within such special areas will be strictly controlled, or if absolutely necessary, excluded. Use or occupancy will be restricted only when the Bureau of Land Management and/or the surface management agency demonstrates the restriction necessary for the protection of such special areas and existing or planned uses. Appropriate modifications to imposed restrictions will be made for the maintenance and operations of producing oil and gas wells.

After the SMA has been advised of specific proposed surface use or occupancy on the leased lands, and on request of the lessee/operator, the Agency will furnish further data on any special areas which may include:

100 feet from the edge of the rights-of-way from highways, designated county roads and appropriate federally-owned or controlled roads and recreation trails.

500 feet, or when necessary, within the 25-year flood plain from reservoirs, lakes, and ponds and intermittent, ephemeral or small perennial streams; 1,000 feet, or when necessary, within the 100-year flood plain from larger perennial streams, rivers, and domestic water supplies.

500 feet from grouse strutting grounds. Special care to avoid nesting areas associated with strutting grounds will be necessary during the period from March 1 to June 30. One-fourth mile from identified essential habitat of state and federal sensitive species. Crucial wildlife winter ranges during the period from December 1 to May 15, and in elk calving areas, during the period from May 1 to June 30.

300 feet from occupied buildings, developed recreational areas, undeveloped recreational areas receiving concentrated public use and sites eligible for or designated as National Register sites.

Seasonal road closures, roads for special uses, specified roads during heavy traffic periods and on areas having restrictive off-road vehicle designations.

On slopes over 30 percent, or 20 percent on extremely erodable or slumping soils.

(Date)

(Signature)

APPENDIX C

METHODOLOGY OF RMP ALTERNATIVES BROCHURE

Three informational brochure mailings have occurred since initiation of the Powder River RMP in 1980. In May 1981, 1,225 copies were mailed to everyone on the District's mailing list of persons or firms known to have been interested in the Powder River Resource Area. The initial mailing asked for comments on 13 issues considered in the initial planning process of the RMP. An even broader base of participation was sought in the second mailing in June and July of 1982 in which we focused on five issues as the result of 32 responses to the initial mailing. This second mailing was made to 4,072 rural and post office box holders of all post offices within the Resource Area. As the result of responses to the question of whether the recipient was interested in being included on the RMP mailing list, 289 addresses formed the basis of the mailing list for the third mailing. In addition, the list was screened to be sure all 454 surface owners over high and moderate potential federal coal, determined from county records, were included in our RMP mailing list. Some addresses of other federal, state and local governmental agencies or offices were also added to fulfill our requirement for consultation. Thus 979 names or addresses were included on the RMP mailing list which received the third brochure mailed in May 1983. In addition, approximately 358 more brochures were distributed through potential user groups.

The purpose of this brochure was to obtain public comment on their preferences for a "Preferred Alternative" for the Powder River Resource Management Plan (1984). The brochure suggested five different management themes that ranged from an emphasis on resource protection to an emphasis on resource development. There was a space left on the brochure for respondents to make up their own preferred alternative. Quite a few respondents did take the time to develop their own preferred alternative.

Following the check-off for each alternative was an open-ended question asking why they preferred or disliked each alternative. This question was designed to get an understanding of the reasons and attitudes behind the publics' preferences. Well over half of the respondents made an attempt to clarify the reasons for their preferences. At least a quarter of them wrote rather long and detailed responses.

There were 1,337 brochures mailed out and 237 were returned for a total response rate of 18%. Twenty-four returns out of the total 237 were unuseable. This left a useable sample of 213.

Respondent Characteristics

There were two separate approaches taken to an understanding of potentially affected user publics in the Powder River Resource Area.

The first approach was to add a question on the brochure about what user group they most strongly identified with. They were given a check-list of options and asked to check just one. Unfortunately, quite a few respondents ignored the directions and checked more than one category. There were also some respondents that didn't check any category. So the data received has less reliability and more limitations than desired. About three times as many respondents said they identified with ranchers rather than any other group. Of the respondents, 93 checked ranchers, 38 checked hunters, 19 checked miners and energy workers, 18 checked wilderness users, 17 checked naturalists, 5 checked ORV recreationists and 3 checked cultural (Native American).

The other approach taken to increase an understanding of potentially affected user publics was to compile an additional mailing sample. Different types of potential user groups were identified such as: mining interests, hunting interests, ranching interests, wilderness interests and naturalist interests. The chairpersons or leaders of different groups were contacted such as: 1) Montana People for Progress (mining interests); 2) United Mine Workers; 3) Farm Bureau Organization (ranching); 4) Rosebud/Treasure County Wildlife Association (hunters and naturalists); 5) Rosebud Audubon Society (naturalists); 6) Custer County Rod and Gun Club (hunters); 7) Wilderness Society (wilderness users); 8) Northern Plains Resource Council (ranching) They were asked if they would be willing to hand out some RMP brochures among their membership. All of the above chairpersons cooperated. For each user category, except for cultural (Native American) and ORV recreationists, there were 50 brochures sent out. There were 50 brochures each for the Northern Cheyenne and the Crow tribes, which were hand delivered to tribal representatives. Efforts were unsuccessful in finding an organized ORV group in this area.

From this special mailing, 32 brochures were returned out of a total 358 sent out. The nine percent return rate was somewhat disappointing. No response from Native Americans were returned, although there were three responses from the usual mailing list with the cultural (Native American) interest checked. Of the groups that participated, the Farm Bureau Organization, the Wilderness Society, and the Montana People for Progress were the most conscientious in returning brochures. It is hard to tell whether it was lack of group organization or lack of interest which made the response rate so low. But at least an effort was made to increase the representation of different user groups/publics in the RMP planning process.

Portions of the existing mailing list were coded to keep track of respondents who were surface owners, or represented industry, represented conservation/environmental groups, or were members of the District Grazing Advisory Board, or were Native Americans. Surface owners definitely do represent one of the valid responses.

There were two responses received from members representing the Crow tribe. They both supported the #1 Environmental Enhancement Alternative. One respondent elaborated "the federal government should not compete with the private sector in the coal market. We would be against selling or exchanging federal lands and selling coal unless, of course, due to a National emergency."
No valid responses were received from the Northern Cheyenne tribe.

The analysis also kept track of geographical location of respondents. There were responses from all of the counties in the Resource Area. About three-quarters of the total responses came from within the Resource Area. More people responded from Powder River, Rosebud, and Custer than the other counties. There were nine responses from Sheridan and 23 from other locations within Montana. About 24 people responded from out of state.

Unfortunately, without a random sample, scientifically executed, it is impossible to ascertain the representativeness of the sample to the total population. The RMP Alternatives Brochure design did not use a random sampling technique. So it is impossible to tell whether these views represent the views of the general population. But since such a large (1,337) mailing was undertaken and extra sampling techniques were pursued, one might say perhaps the most concerned user publics responded. Responses were received from every county in the Resource Area. Responses were received from those identified as surface owners, industrialists, conservationists, government representatives and staff, and Native Americans. Responses were received from members of the Farm Bureau Organization, District Grazing Advisory Board, Northern Plains Resource Council, United Mine Workers, Montana People for Progress, Custer County Rod and Gun Club, Rosebud/Treasure County Wildlife Association, Rosebud Audubon and the Wilderness Society. From the brochure check-off list, responses were received from every user group identifed: energy workers, ranchers, hunters, wilderness users, naturalists, ORV recreationists and cultural users.

APPENDIX D

FEDERAL COAL LANDS REVIEW PROCESS

Application of Unsuitability Criteria

The unsuitability criteria in 43 CFR 3461 provide that coal lands shall be considered unsuitable for all or certain stipulated methods of coal mining if they fall within any of 20 categories listed in this Appendix.

In conformance with this requirement, all 1,125,600 acres of federal coal with development potential in new planning were assessed to see what unsuitability criteria applied. As a result, 64,081 acres containing 4.9 billion tons of coal were found unsuitable without exception for coal leasing, as shown in Table 2-7 of the main text. An additional 38,411 acres, as shown in Table 2-8, were identified as containing unsuitability criteria where an exception has been made or may be applied in the future, and carried forward for further lease consideration with stipulations. Also identified were 856 stream miles of preliminarily identified alluvial valley floors on both federal and private minerals. Because wildlife inventories were incomplete over much of the coal region, 519,900 acres in Alternative B and 587,000 acres in Alternative C were identified as acceptable for further lease consideration pending further wildlife studies.

Methods

From January to March 1983, the Resource Area staff identified locations where unsuitability criteria applied within the coal with development potential area occurred. Overlays showing application of the individual criteria were compiled at 1:100,000 scale for the six quadrangles covering the coal area (Birney, Broadus, Lame Deer, Powderville, Miles City and Forsyth). Composite overlays were constructed showing application of the unsuitability criteria, areas deleted due to unsuitability criteria, and areas needing further study. These overlays are available for inspection at the Miles City District Office. Unsuitability determinations were made by legal subdivision. The minimum acreage deleted was a quarter of a quarter section (40 acres) or an individual lot. Only in the case of floodplains was acreage deleted on other than a legal subdivision. Unsuitable acreages and tonnages are described by legal subdivision and discussed by criterion and county in the coal Management Situation Analysis on file at the Miles City District Office.

Results

The following is a summary of results obtained for each criterion. In general, Criteria 1, 2, 3 and 6 refer to land status; Criteria 4, 5 and 8 refer to recreational and natural values; Criterion 7 refers to cultural resources; Criteria 9 through 15 refer to wildlife; Criteria 16 through 19 refer to watershed; and Criterion 20 refers to issues proposed by the State.

Lands

Criterion 1—Federal Land Systems

Two tracts totalling 331 acres were identified as unsuitable without exception. Both are withdrawn by the U.S. Forest Service for administrative purposes.

Criterion 2—Rights-of-Way Easements

A 100-foot wide right-of-way along roads on federal surface was identified as unsuitable. Such rights-of-way totalled 257 acres. An exception could be applied at a future date if all parties involved agreed to a relocation plan.

Criterion 3—Buffer Zones along Road Rights-of-Way and Adjacent to Communities, Public Schools, Occupied Dwellings, Churches, Public Parks, and Cemeteries

One public park—Woodruff Park in the Pine Hills east of Miles City—containing 76 acres, one cemetery containing one acre, and five schools and buffer zones containing 35 acres, were identified as unsuitable for mining without exception.

Road rights-of-way (100 feet) plus a buffer of 100 feet outside each side of the right-of-way (a total of 300 feet) are unsuitable for mining. A total of 12,837 acres of road rights-of-way and buffers were identified. Land under occupied dwellings and within a 300-foot buffer is unsuitable for mining. A total of 1,489 acres of dwellings and buffers were identified. An exception could be applied to dwellings and rights-of-way in the future if all parties involved agree to a relocation plan.

Criterion 6—Lands Used for Scientific Study

No areas were identified as unsuitable under this criterion.

Recreational and Natural Values

Criterion 4—Wilderness Study Areas

Two Wilderness Study Areas (WSAs) were found unsuitable without exception. A total of 8,438 acres covering the entire Zook Creek WSA were deleted from further lease consideration. This acreage is slightly larger than the actual acreage of the WSA, because deletions were made on legal subdivisions. A total of 5,933 acres were deleted for Buffalo Creek WSA. This acreage differs slightly from actual WSA acreage because of legal subdivisions and also because a small part of the WSA lies outside the high and moderate coal area. If the WSAs were dripped from Wilderness consideration, the areas could be screened further for leasing consideration.

Criterion 5—Scenic Areas

Because WSAs are designated Class 1 scenic areas in Visual Resource Management, the 8,438 acres in Zook Creek and 5,933 acres in Buffalo Creek have also been deleted as unsuitable without exception under Criterion 5 as well as 4.

Criterion 8—Natural Areas

No areas were identified as unsuitable under this criterion.

Cultural Resources

Criterion 7—Historic Lands and Sites

Reynolds Battlefield in Powder River County, containing 1,404 acres, and Rosebud Battlefield in Big Horn County, containing 5,051 acres, have been identified as unsuitable without exception. These areas would lose nearly all value if the original surface were modified.

An additional 6,776 acres, containing known significant historic and prehistoric sites eligible for or on the National Register of Historic Places, were identified as unsuitable. However, if the Advisory Council on Historic Preservation and the State Historic Preservation Officer determine that the action will have no significant adverse effect on the properties, an exception may be applied. Pending such determinations, the exceptions have been applied to the eligible sites and submitted to the review agencies for comment.

Wildlife

Recommendations for Criteria 9 through 15 were developed in cooperation with personnel from the Montana Fish, Wildlife and Parks and the U.S. Fish and Wildlife Service. References to source material used to develop overlays are listed in the MSA for coal.

Wildlife-related unsuitability criteria were only applied on the acreage where inventory was complete. Known sites in areas with incomplete wildlife inventory were identified on the overlays but not tallied in the acreage tabulations. Areas lacking inventory have been identified as acceptable for further lease consideration pending further study. A reasonable timetable for conducting remaining wildlife studies in the areas pending further study is listed in the coal MSA.

All buffer zones were established using legal subdivisions encompassing recognizable appropriate land forms on quad maps.

Data used were those available as of February 18, 1983. Wildlife survey data does become outdated. For any proposed coal tract, a wide variety of updated information may be required for a particular activity plan.

Criterion 9—Federally Listed Endangered Species

No areas were identified as unsuitable under this criterion.

Criterion 10—State Listed Endangered Species

No areas were identified as unsuitable under this criterion.

Criterion 11—Bald and Golden Eagle Nest Sites

Seventeen golden eagle nests and buffer zones, totalling 6,840 acres, were the only unsuitable habitat found. No exception was applied under this criterion.

Criterion 12—Bald and Golden Eagle Roost and Concentration Areas

Bald eagle winter concentration areas along the Tongue River, totalling 2,020 acres, were the only unsuitable habitat found. No exception was applied under this criterion.

Criterion 13—Falcon Cliff Nesting Sites

Fourteen prairie falcon nests and appropriate buffer zones, totalling 4,540 acres, were the only unsuitable habitat found. No exception was applied under this criterion.

Criterion 14—Migratory Birds of High Federal Interest

No areas were identified as unsuitable under this criterion.

Criterion 15—State Resident Fish and Wildlife

A variety of habitats associated with seven wildlife species were identified as unsuitable. On some of the Criterion 15 acreage "a lease may be issued if, after consultation with the State, the surface management agency determines that all or certain stipulated methods of coal mining will not have a significant long-term impact on the species being protected" (43 CFR 3461.(o)(1)). These mitigable acreages consist of sharp-tailed grouse and sage grouse leks with buffer zones, and sage grouse wintering areas. Habitat recovery and replacement plan requirements are detailed in the coal MSA. Critical mule deer, white-tailed deer, antelope, and bighorn sheep winter range as well as critical turkey wintering areas were identified as unsuitable without exception.

Wildlife acreage identified as unsuitable without exception includes:

22,141 acres of mule deer winter range;
7,689 acres of antelope winter range;
4,782 acres of overlapping mule deer and antelope winter range;
960 acres of white-tailed deer winter range;
3,374 acres of turkey wintering areas; and
318 acres of bighorn sheep winter range.

36,544 total acres unsuitable without exception*

Wildlife acreage identified as unsuitable with exceptions includes:

5,421 acres within 16 sage grouse leks and buffer zones;
21,594 acres within 96 sharptailed grouse leks and buffer zones; and
4,081 acres of sage grouse winter habitat.

27,086 total acres unsuitable with exceptions*

*Totals are slightly smaller than the sum of the various categories due to overlap among habitat of different species.

Watershed

Criterion 16—Floodplains

Floodplains defined as unsuitable without exception contain 3,215 acres along the Tongue River and 2,966 acres along the Powder River. There are large developed acreages along these two rivers. Criterion 16 requires that mining on floodplains could not take place if therer would be substantial threat of loss of life or property. Floodplains of lesser streams were not deleted because mining was not identified as posing a substantial threat of loss of life or property.

Criterion 17—Minicipal Watersheds

No areas were identified as unsuitable under this criterion.

Criterion 18—Natural Resource Waters

No areas were identified as unsuitable under this criterion.

Criterion 19—Alluvial Valley Floors (AVFs)

No acreage was deleted at this time due to alluvial valley floors. However, 856 stream miles within the coal with development potential area were identified as preliminarily alluvial valley floors based on color infrared air photo interpretation by BLM staff and comparison with 1:100,000 scale reconnaissance maps of AVFs in the northern Powder River Basin, prepared by Earth Resource Associates in 1983 for the Office of Surface Mining. The miles identified were over private as well as federal coal. Final determination and deletion of alluvial valley floors would be made at the mine planning stage.

State Concerns

Criterion 20—State Proposed Criteria

No areas were identified as unsuitable under this criterion.

Surface Owner Consultation Process

According to Public Law 95-87, the 1977 Surface Mining Control and Reclamation Act (SMCRA), all comprehensive land use plans involving potential coal leasing shall consult with qualified private surface owners over federal coal with development potential, and ask the surface owner to state his/her preference for or against the offering of the deposit under his/her land for lease. In conformance with this requirement, letters were sent out on January 19-21, 1983, to all 454 private surface owners over the 943,000 acres of coal with development potential in the Resource Area not considered in previous planning. (See the end of this Appendix.) The new planning areas contain an additional 183,000 acres of public surface over public minerals. Surface owners were requested to respond within 30 days; however, late responses were accepted for planning purposes until March 4, 1983. The letter did not ask for surface owner consent; rather, it requested views to help BLM decide which coal lands in the Powder River Basin should and should not be considered further for possible leasing. Areas with significant negative surface owner views were dropped from further consideration for leasing in this RMP; all other areas were carried forward as acceptable for further consideration. The decision on which specific coal lands will be leased will be made in a separate process, called activity planning, which is beyond the scope of the RMP.

Surface Owner Response Analysis

Of the 454 letters sent out, 246 were returned, for a 54% response rate. The responses covered 569,000 acres, or 60% of the total 943,000 acres included in the mailing. Tables D-1 and D-2 show number and acreage of responses by county.

The figures in the tables show that the response was greatest in Big Horn County, where 80% of the landowners responded. Response was lowest (below 50%) in Powder River and Treasure Counties. In general, landowners closer to existing mining operations or proposed developments (concentrated in Big Horn and Rosebud Counties) were more responsive than those far away from coal activity. Large landowners were slightly more responsive than small landowners. (The 54% response rate covered 60% of the acreage.)

TABLE D-1
CONSULTATION SUMMARY AND NUMBER OF RESPONSES

County	Total Letters Sent	Total Response Received	Response/ Total = %
Big Horn	90	72	80.0
Rosebud	84	43	51.2
Powder River	223	103	46.2
Custer	51	26	51.0
Treasure	6	2	33.3
Total	454	246	54.2

In the letter, owners were asked to show themselves as: 1) in favor of, 2) against, or 3) undecided about leasing of Federal coal underneath their surface. They were also asked to state: 4) if their surface was already under lease by a coal company and 5) whether they met the requirements as a qualified surface owner under SMCRA. The number and acreage of responses, by county, in these five categories are listed in Tables D-3 and D-4.

The figures show that opinions about coal leasing vary significantly by county. In the following discussion, both "favor" and "leased" views are counted as "favor." Views of unqualified owners are not counted; however, it should be noted that unqualified owners include the State of Montana as well as coal companies and private individuals. In Big Horn County, views heavily favor coal leasing (58% of response, 77% of acreage). Only 31% of views (17% of acreage) oppose leasing, and few people (11%) are undecided. In contrast, a majority of views in Rosebud County oppose coal leasing (53% of response, 42% of acreage). Only 32% are in favor, and 15% are undecided. However, those in favor have 53% of the acreage surveyed in Rosebud County. In Powder River County, views are split more evenly; 39% are in favor, 32% against, and 29% undecided. However, the acreage held by undecided landowners (37%) is almost as great as the acreage held by those in favor (40%). Views against leasing hold only 23% of the acreage. In Custer County, views are mainly against (55%) or undecided (36%). Only 9% are in favor of leasing. These figures are fairly close to the acreage owner of owners against (49%), undecided (42%) and in favor (9%). The two responses received from Treasure County are too few a number to reach statistically significant conclusions.

TABLE D-2
ACREAGE REPRESENTED BY RESPONSE

County	Letters Sent (Acres)	Response Received (Acres)	Response/ Total = %
Big Horn	273,526	215,789	78.9
Rosebud	170,113	114,167	67.1
Powder River	446,401	210,608	47.2
Custer	48,543	26,934	55.5
Treasure	3,978	1,858	46.7
Total	942,561	569,356	60.4

The high percentage of undecided views in Powder River and Custer Counties may reflect the fact that these counties are further away from coal development. People may be less personally affected by development and have not formed strong opinions.

TABLE D-3
BREAKDOWN OF RESPONSES BY NUMBER

County	Favor		Against		Undecided		Leased		Unqualified	
Big Horn	28	39%	19	26%	7	10%	8	11%	10	14%
Rosebud	7	16%	20	46%	6	14%	5	12%	5	12%
Powder River	27	26%	29	28%	27	26%	9	9%	11	11%
Custer	2	8%	12	46%	8	31%	0	0%	4	15%
Treasure	0	0%	1	50%	1	50%	0	0%	0	0%
Total	64	26%	81	33%	49	20%	22	9%	30	12%

TABLE D-4
BREAKDOWN OF RESPONSES REPRESENTED BY ACREAGE

County	Favor		Against		Undecided		Leased		Unqualified	
Big Horn	127,799	59%	31,256	15%	10,170	5%	13,517	6%	33,047	15%
Rosebud	26,773	23%	39,024	34%	5,381	5%	22,850	20%	20,139	18%
Powder River	50,711	24%	44,548	21%	74,924	36%	30,248	14%	10,177	5%
Custer	1,487	6%	8,274	31%	7,073	26%	0	0%	10,100	37%
Treasure	0	0%	1,520	82%	338	18%	0	0%	0	0%
Total	206,770	36%	124,622	22%	97,886	17%	66,615	12%	73,463	13%

(Percentages calculated are percentages of total responses in county.)

The figures also show that large landowners tend to be more in favor of coal development than small landowners. The tables consistently show that the percentage of acreage in favor is greater than the percentage of landowners in favor. Overall, 55% of the acreage is in the "favor" category while only 40% of the landowners are in favor; 38% of the landowners are against leasing, but they only control 25% of the acreage. This pattern may be due to large ranchers being more able to afford part of their land being taken out of production for coal development. In contrast, small ranchers must depend on all their land to have a viable operation.

Deletions Due to Negative Surface Owner Views

As a result of surface owner consultation, over 104,421 acres of private surface over 4.91 billion tons of coal with development potential were deleted from further consideration for coal leasing due to negative surface owner views. By county, the acres and tonnages deleted are shown in Table 2-6.

Significant negative views satisfied one or more of the following criteria:

—they covered several sections in a solid pattern;

—they blocked up checkerboard federal coal ownership in a pattern to preclude mine development;

—they were in addition to significant negative surface owner views expressed from the same owner in previous coal planning efforts;

—they covered a significant area adjacent to Custer National Forest;

—they overlapped with or were adjacent to large areas deleted due to unsuitability criteria.

Some areas of federal coal without negative views were deleted where surrounded by or sandwiched between negative views in a pattern which would have prevented establishment of logical mining areas. In other cases, negative surface owner views covering only a small isolated area were not deleted.

Overlap showing application of the surface owner screens are available for inspection at the Miles City District Office.

Multiple Use Conflict Analysis

Coal planning regulation 43 CFR 3420.1-4e(3) states that "multiple land use decisions shall be made which may eliminate additional coal deposits from further consideration for leasing, to protect resource values of a locally important or unique nature not included in the unsuitability criteria."

Coal areas leased and cleared in previous planning were already analyzed for multiple use conflicts in the existing MFPs (Decker-Birney, South Rosebud and Coalwood). These MFPs were determined to meet principles of multiple use/sustained yield as required by Section 103 (c) and (h) of FLPMA. For this RMP, multiple use conflicts were considered only on the 957,200 acres of Federal coal in new planning which had passed through the unsuitability and surface owner screens. BLM requested information regarding religious sites from the Northern Cheyenne Tribe in compliance with the American Indian Religious Freedom Act. No information was received.

Factors in Analysis

Twelve resource categories and factors were defined which could be significantly affected by mining. These were:

1) Negative surface owner views which were not deleted by the surface owner consultation screen;

2) Soils in USDA Soil Conservation Service land capability classes VII and VIII. These are soils and landforms with questionable reclaimability due to the chemical and physical properties of the soils. Factors such as steep slopes, sodium content and depth to bedrock, for example, influence this determination;

3) Cropland in preliminarily identified AVFs and in areas of negative surface owner views defined in Category 1. Lands currently being used as cropland are delineated in the Conservation Districts' Long Range Program for Resource Conservation, published by the USDA Soil Conservation Service;

4) Wildlife values*, including whitetail, mule deer, and antelope winter range and all-season use, and turkey, raptor, and grouse habitat. Known potentially unsuitable wildlife values in areas where inventory was incomplete were also delineated as multiple use conflicts;

5) Power plants and associated facilities;

6) Areas of significant hunting or other recreational use, and Class II or higher Visual Resource Management areas;

7) Buffer zones around townsites;

8) Forested areas, as defined on public surface by a BLM survey of commercial and noncommercial forest land conducted in the mid 1960s, and on private surface by shading on 1:100,000 scale USGS topographic maps;

9) Oil and gas fields defined by the Montana Oil and Gas Commission and Known Geologic Structures defined by BLM;

10) Cultural resource sites eligible for the National Register of Historic Places but suitable for leasing with stipulations under the unsuitability criteria;

11) Existing Allotment Management Plans;

12) Areas preliminarily identified as AVFs by BLM staff. Color infrared aerial photography was analyzed as well as reconnaissance maps of alluvial valley floors in the Montana portion of the Powder River Basin, prepared by Earth Resources Associates in 1983 for the Office of Surface Mining. Consideration of AVFs for multiple use conflict purposes is in addition to the requirement under unsuitability Criterion 19 that alluvial valley floors be deleted at mine plan stage. Some of these areas also contain riparian wildlife habitat.

Methods

Transparent overlays for each of the twelve multiple use categories were stacked onto 1:100,000 scale base maps for each of the six quadrangles with coal potential in the Resource Area (Birney, Broadus, Lame Deer, Powderville, Miles City, and Forsyth). While one multiple use conflict by itself was generally considered not enough to drop an area from further coal leasing consideration, having several overlapping multiple use conflicts over a single area was considered significant. In general, areas with four or more overlapping multiple uses were deleted from further lease consideration. However, the actual number of overlaps needed varied. Power plants and townsite buffer zones were deleted whether or not there were additional overlaps. Areas containing very thick coal close to the surface and near current or proposed mining may have needed more than four multiple use conflicts to be deleted, because the high coal potential of the area was weighted as an additional multiple use consideration. Some areas having fewer than four conflicts were deleted where they were wedged between large blocks of land with four or more overlapping conflicts.

Because of the large number of overlapping multiple uses in the Broadus and Birney quadrangles, two groups of BLM staff independently deleted areas from further leasing consideration. These two sets of maps were then compared and the final areas deleted, reflecting a compromise between the two groups. Areas were deleted based on legal subdivisions. Transparent overlays at 1:100,000 scale showing application of multiple use conflicts and areas deleted due to multiple use conflicts are available at the Miles City District Office for inspection.

Multiple use analysis was based on resource information available as of mid-1983.

Results

A total of 94,700 acres over 46.3 billion tons of federal coal with development potential were deleted due to multiple use conflicts. Most areas deleted due to multiple use conflicts are concentrated in corridors within a few miles of the Tongue and Powder Rivers. These areas have soil, forest, wildlife, recreational, agricultural, and watershed characteristics which make them less environmentallly desireable for mining. Other areas deleted due to multiple use conflicts lie near Rosebud, Otter, and Pumpkin Creeks. The remaining areas are scattered throughout the rest of the coal area.

Areas deleted due to multiple use conflicts are summarized in Table D-5.

TABLE D-5
AREAS DELETED DUE TO MULTIPLE USE CONFLICTS

County	Acres	Tons (billion)
Big Horn	6,200	0.84
Rosebud	36,700	2.25
Treasure	0	0.00
Custer	6,600	0.22
Powder River	45,200	1.32
Total	94,700	4.63

APPENDIX E

ALLOTMENT SUMMARIES AND UTILIZATION COMPUTATION

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use	%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																			ST	LT	ST	LT	ST	LT	ST	LT		
3300	0001	76	1,920	1,996	-	36	40	-	-	-	-	1	C	03-01 02-28	100	12	-	12	12	12	12	12	12	12	10	12	C	15
3301	0002	354	12,446	12,800	240	114	-	-	-	-	-	6	C	03-01 02-28	100	71	-	71	71	71	71	71	71	71	71	71	C	99
3302	0003	697	4,957	5,654	-	411	286	-	-	-	-	10	C	03-01 02-28	100	122	-	122	122	122	122	122	122	122	82	95	C	153
3303	0004	160	7,650	7,810	29	131	-	-	-	-	-	2	C	03-01 02-28	100	24	-	24	24	24	24	24	24	24	24	24	C	35
3304	0005	509	6,341	6,850	138	172	161	-	38	-	-	9	C	03-01 02-28	100	112	-	112	112	112	112	112	112	112	92	101	C	92
3305	0006	840	2,160	3,000	-	840	-	-	-	-	-	1	C	03-01 02-28	100	6	-	131	131	131	131	131	131	131	131	131	C	205
												11	C	03-01 02-28	100	125	-											
3306	0007	920	5,300	6,220	-	417	503	-	-	-	-	12	C	03-01 02-28	100	142	-	142	142	142	142	142	142	142	125	142	C	154
3307	0008	1,619	5,406	7,025	-	922	682	-	15	-	-	15	C	03-01 02-28	100	179	-	179	179	179	179	179	179	179	108	132	C	287
3308	0009	80	50	130	-	80	-	-	-	-	-	1	C	03-01 02-28	100	12	-	12	12	12	12	12	12	12	12	12	C	15
3309	0010	657	1,425	2,082	-	38	611	8	-	-	-	9	C	03-01 02-28	100	115	-	115	115	115	115	115	115	115	63	86	C	99
3310	0011	626	6,600	7,226	245	332	36	-	13	-	-	8	C	03-01 02-28	100	101	-	101	101	101	101	101	101	101	95	96	C	140
3311	0014	4,911	13,290	18,201	6	1,267	3,565	73	-	-	-	72	C	03-01 02-28	100	865	-	865	865	865	865	1041	865	1458	684	983	M	703
3312	0015	1,840	7,200	9,040	-	680	1,154	-	6	-	-	44	C	03-01 02-28	100	526	-	526	526	526	526	385	526	539	288	385	I	288
3313	0016	1,202	3,520	4,722	-	507	695	-	-	-	-	12	C	03-01 02-28	100	150	-	150	150	150	150	150	150	150	127	150	C	173
3314	0017	360	3,840	4,200	-	210	150	-	-	-	-	7	C	03-01 02-28	100	85	-	85	85	85	85	85	85	85	75	85	C	75
3315	0018	40	6,400	6,440	-	40	-	-	-	-	-	1	C	03-01 02-28	100	7	-	7	7	7	7	7	7	7	7	7	C	10
3316	0019	360	1,940	2,300	-	187	173	-	-	-	-	6	C	03-01 02-28	100	72	-	72	72	72	72	72	72	72	64	72	C	66
3318	0021	2,988	28,000	30,988	-	1,282	1,653	53	-	-	-	25	C	03-01 02-28	100	297	-	297	297	297	297	573	297	801	206	539	I	410
3319	0022	2,715	22,304	25,019	3	2,619	93	-	-	-	-	35	C	03-01 02-28	100	423	-	427	427	427	427	427	427	427	412	415	C	643
3320	0023	40	1,663	1,703	23	17	-	-	-	-	-	1	C	03-01 02-28	100	8	-	8	8	8	8	8	8	8	8	8	C	14
3321	0024	1,267	6,080	7,347	-	387	859	21	-	-	-	14	C	03-01 02-28	100	172	-	172	172	172	172	172	172	172	144	172	C	180
3322	0025	2,105	17,330	19,435	-	504	1,404	32	165	-	-	31	C	03-01 02-28	100	378	-	378	378	378	378	495	378	693	228	400	M	343
3323	0026	40	7,680	7,720	-	-	40	-	-	-	-	1	C	03-01 02-28	100	3	-	3	3	3	3	3	3	3	1	3	C	8
3324	0027	1,807	7,260	9,067	-	375	1,245	-	187	-	-	19	C	03-01 02-28	100	234	-	234	234	234	234	288	234	404	192	286	I	192
3325	0028	7,964	19,843	27,777	-	4,839	3,087	8	-	-	-	120	C	03-01 02-28	100	1445	-	1445	1445	1445	1445	1552	1445	2174	1276	1478	M	1299
3326	0029	1,720	14,054	15,774	3	1,003	613	-	101	-	-	32	C	03-01 02-28	100	382	-	382	382	382	382	382	382	382	313	340	C	313
3327	0030	896	4,350	5,246	22	420	112	1	341	-	-	23	C	03-01 02-28	100	277		277	277	277	277	277	277	277	150	277	C	150
3328	0031	40	20,000	20,040	-	40	-	-	-	-	-	1	C	03-01 02-28	100	8	-	8	8	8	8	8	8	8	6	8	C	6
3329	0032	1,403	3,840	5,243	-	418	833	-	145	-	7(A)	9	C	03-01 02-28	100	110	-	110	110	110	110	243	110	340	66	225	I	175
3330	0033	320	2,540	2,860	-	203	117	-	-	-	-	3	C	03-01 02-28	100	30	-	30	30	30	30	30	30	30	26	30	C	51
3333	0036	1,280	7,447	8,727	-	374	852	-	54	-	-	16	C	03-01 02-28	100	190	-	190	190	190	190	190	190	190	157	190	C	204
3334	0037	640	25,000	25,640	-	544	71	-	25	-	-	9	C	03-01 02-28	100	114	-	114	114	114	114	114	114	114	111	114	C	130
3335	0038	322	3,976	4,298	-	147	144	31	-	-	-	4	C	03-01 02-28	100	51	-	51	51	51	51	51	51	51	47	51	C	53
3336	0039	1,227	4,284	5,511	-	324	786	-	117	-	-	20	C	03-01 02-28	100	236	-	236	236	236	236	236	236	236	201	236	C	201
3337	0040	543	15,168	15,711	-	543	-	-	-	-	-	9	C	03-01 02-28	100	106	-	106	106	106	106	106	106	106	106	106	C	125
3338	0041	480	32,000	32,480	-	374	106	-	-	-	-	6	C	03-01 02-28	100	76	-	93	93	93	93	93	93	93	73	90	C	73
3339	0042	156	3,845	4,001	-	46	89	-	21	-	-	4	C	03-01 02-28	100	47	-	47	47	47	47	47	47	47	13	47	C	13
3340	0043	160	3,040	3,200	-	80	80	-	-	-	-	2	C	03-01 02-28	100	24	-	24	24	24	24	24	24	24	20	24	C	24
3341	0044	37	2,200	2,237	-	37	-	-	-	-	-	1	C	03-01 02-28	100	5	-	5	5	5	5	5	5	5	5	5	C	10
3342	0045	313	3,840	4,153	-	154	159	-	-	-	-	3	C	03-01 02-28	100	39	-	39	39	39	39	39	39	39	33	39	C	44
3343	0046	320	2,230	2,550	-	220	93	-	7	-	-	6	C	03-01 02-28	100	76	-	76	76	76	76	76	76	76	72	76	C	74
3344	0048	2,911	26,680	29,591	-	1,698	1,200	13	-	-	-	32	C	03-01 02-28	100	383	-	383	383	383	383	383	383	383	328	364	C	351
3345	0049	630	23,352	23,982	-	412	218	-	-	-	-	8	C	03-01 02-28	100	93	-	93	93	93	93	93	93	93	84	93	C	131
3346	0050	1,282	22,952	24,234	8	631	604	-	39	-	-	15	C	03-01 02-28	100	180	-	180	180	180	180	180	180	180	156	180	C	254
3347	0051	80	1,410	1,490	-	80	-	-	-	-	-	1	C	03-01 02-28	100	12	-	12	12	12	12	12	12	12	12	12	C	25
3348	0052	40	489	529	-	40	-	-	-	-	-	1	C	03-01 02-28	100	7	-	7	7	7	7	7	7	7	7	7	C	8
3349	0053	5,298	103,560	108,858	53	3,862	1,377	-	-	-	6(A)	106	C	03-01 02-28	100	1280	-	1280	1280	1280	1280	1280	1280	1280	1191	1280	C	1191

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use	%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																			ST	LT	ST	LT	ST	LT	ST	LT		
3350	0054	1,417	4,720	6,137	-	268	1,049	100	-	-	-	17	C	03-01 02-28	100	211	-	211	211	211	211	345	211	482	168	345	M	210
3351	0055	1,086	6,640	7,726	-	648	393	41	4	-	-	14	C	03-01 02-28	100	172	-	172	172	172	172	172	172	172	138	172	C	138
3352	0056	650	4,440	5,090	-	202	415	33	-	-	-	5	C	03-01 02-28	100	59	-	59	59	59	59	59	59	59	45	59	C	90
3353	0057	560	16,800	17,360	-	85	475	-	-	-	-	9	C	03-01 02-28	100	103	-	103	103	103	103	103	103	103	79	103	C	79
3354	0058	360	4,107	4,467	-	302	58	-	-	-	-	6	C	03-01 02-28	100	73	-	73	73	73	73	73	73	73	70	73	C	85
3355	0059	120	11,500	11,620	-	-	120	-	-	-	-	2	C	03-01 02-28	100	28	-	28	28	28	28	28	28	28	19	28	C	19
3356	0060	120	3,400	3,520	-	78	42	-	-	-	-	1	C	03-01 02-28	100	18	-	18	18	18	18	18	18	18	16	18	C	27
3357	0061	32	5,580	5,612	-	-	32	-	-	-	-	1	C	03-01 02-28	100	3	-	3	3	3	3	3	3	3	3	3	C	7
3358	0062	1,686	6,488	8,174	101	1,096	422	67	-	-	-	16	C	03-01 02-28	100	188	-	188	188	188	188	384	188	527	154	367	M	322
3359	0063	226	1,113	1,339	-	208	18	-	-	-	-	4	C	03-01 02-28	100	50	-	50	50	50	50	50	50	50	49	50	C	58
3360	0064	200	3,120	3,320	-	42	158	-	-	-	-	1	C	03-01 02-28	100	43	-	43	43	43	43	43	43	43	28	43	C	28
3361	0065	670	3,600	4,270	64	606	-	-	-	-	-	7	C	03-01 02-28	100	86	-	86	86	86	86	86	86	86	78	86	C	78
3362	0012	295	2,539	2,834	-	-	295	-	-	-	-	1	C	03-01 02-28	100	17	-	17	17	17	17	17	17	17	11	17	C	24
3363	0013	4,762	5,863	10,625	386	2,534	1,830	12	-	-	-	43	C	03-01 02-28	100	513	-	513	513	513	513	872	513	1,181	438	854	M	717
3364	0067	783	6,600	7,383	-	2	479	302	-	-	-	8	C	03-01 02-28	100	97	-	97	97	97	97	97	97	97	63	96	C	63
3365	0068	2,172	27,150	29,322	-	1,654	518	-	-	-	-	34	C	03-01 02-28	100	407	-	407	407	407	407	527	407	738	386	527	M	471
3368	0072	80	520	600	-	-	80	-	-	-	-	1	C	03-01 02-28	100	14	-	14	14	14	14	14	14	14	11	14	C	12
3369	0073	80	2,300	2,380	-	60	-	-	20	-	-	1	C	03-01 02-28	100	12	-	12	12	12	12	12	12	12	12	12	C	12
3370	0076	33	101	134	-	33	-	-	-	-	-	3	C	03-01 02-28	100	31	-	31	31	31	31	31	31	31	12	31	C	12
3371	0075	803	5,403	6,206	-	352	451	-	-	-	-	9	C	03-01 02-28	100	104	-	104	104	104	104	104	104	104	86	104	C	139
3372	0712	12	40	52	-	12	-	-	-	-	-	1	C	03-01 02-28	100	3	-	3	3	3	3	3	3	3	3	3	C	4
3373	0077	369	1,600	1,969	-	87	282	-	-	-	-	4	C	03-01 02-28	100	51	-	51	51	51	51	51	51	51	34	51	C	34
3374	0078	432	28,000	28,432	-	26	406	-	-	-	-	6	C	03-01 02-28	100	78	-	78	78	78	78	78	78	78	62	78	C	72
3375	0079	170	1,185	1,355	-	89	81	-	-	-	-	3	C	03-01 02-28	100	32	-	32	32	32	32	32	32	32	29	32	C	33
3376	0080	687	9,000	9,687	-	162	520	-	-	5 C	-	8	C	03-01 02-28	100	95	-	95	95	95	95	95	95	95	79	95	C	87
3377	0081	103	1,591	1,694	-	103	-	-	-	-	-	2	C	03-01 02-28	100	28	-	28	28	28	28	28	28	28	28	28	C	29
3378	0082	813	3,487	4,300	-	244	569	-	-	-	-	19	C	03-01 02-28	100	232	-	232	232	232	232	232	232	232	150	232	C	150
3379	0083	240	4,800	5,040	-	222	18	-	-	-	-	5	C	03-01 02-28	100	55	-	55	55	55	55	55	55	55	54	55	C	62
3380	0084	7,197	24,028	31,225	274	4,645	1,952	80	246	-	-	85	C	03-01 02-28	100	1018	-	1,018	1,018	1,018	1,018	1,295	1,018	1,775	870	1,208	M	1118
3381	0085	3,956	15,300	19,256	-	1,108	2,809	39	-	-	-	58	C	03-01 02-28	100	695	-	695	695	695	695	1,037	695	1,453	577	1,037	I	724
3382	0086	1,563	12,160	13,723	-	673	860	-	30	-	-	28	C	03-01 02-28	100	332	-	332	332	332	332	332	332	332	281	332	C	281
3383	0087	191	27,189	27,380	-	172	19	-	-	-	-	4	C	03-01 02-28	100	47	-	47	47	47	47	47	47	47	40	47	C	40
3384	0088	40	26,012	26,052	-	40	-	-	-	-	-	1	C	03-01 02-28	100	5	-	5	5	5	5	5	5	5	4	5	C	4
3385	0089	476	2,390	2,866	51	425	-	-	-	-	-	7	C	03-01 02-28	100	81	-	81	81	81	81	81	81	81	81	81	C	99
3386	0090	136	2,345	2,481	-	136	-	-	-	-	-	2	C	03-01 02-28	100	28	-	28	28	28	28	28	28	28	28	28	C	29
3387	0091	1,110	5,117	6,227	-	1,110	-	-	-	-	-	2	C	03-01 02-28	100	24	-	182	182	182	182	182	182	182	182	182	C	226
												11	C	03-01 02-28	100	127	-											
3388	0092	687	5,300	5,987	90	453	144	-	-	-	-	9	C	03-01 02-28	100	113	-	113	113	113	113	113	113	113	107	113	C	172
3389	0093	1,125	7,360	8,485	46	656	423	-	-	-	-	77	S	03-01 02-28	100	185	-	185	185	185	185	226	185	315	169	226	M	183
3390	0094	320	11,000	11,320	-	-	320	-	-	-	-	5	C	03-01 02-28	100	67	-	67	67	67	67	67	67	67	34	67	C	34
3391	0095	552	3,144	3,696	-	549	3	-	-	-	-	9	C	03-01 02-28	100	102	-	102	102	102	102	139	102	194	102	139	M	138
3392	0096	80	6,320	6,400	-	53	27	-	-	-	-	1	C	03-01 02-28	100	11	-	11	11	11	11	11	11	11	10	11	C	19
3393	0097	1,472	1,320	2,792	-	970	502	-	-	-	-	18	C	03-01 02-28	100	220	-	220	220	220	220	236	220	330	189	236	M	189
3394	0713	6	40	46	-	6	-	-	-	-	-	1	C	03-01 02-28	100	2	-	2	2	2	2	2	2	2	2	2	C	2
3395	0099	434	1,580	2,014	-	338	96	-	-	-	-	6	C	03-01 02-28	100	70	-	70	70	70	70	111	70	155	66	70	C	101
3396	0100	402	24,440	24,842	-	345	35	-	22	-	-	5	C	03-01 02-28	100	60	-	60	60	60	60	60	60	60	58	60	C	91
3397	0101	440	5,500	5,940	-	440	-	-	-	-	-	1	C	03-01 02-28	100	6	-	78	78	78	78	78	78	78	78	78	C	84
										-	-	2	C	03-01 02-28	100	22	-											
3398	0102	797	2,000	2,797	101	580	116	-	-	-	-	10	C	03-01 02-28	100	116	-	116	116	116	116	66	116	90	58	66	M	58
3399	0103	160	3,040	3,200	-	59	101	-	-	-	-	2	C	03-01 02-28	100	20	-	20	20	20	20	20	20	20	16	20	C	32

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use	%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																			ST	LT	ST	LT	ST	LT	ST	LT		
3400	0104	720	1,280	2,000	-	720	-	-	-	-	-	9	C	03-01 02-28	100	113	-	113	113	113	113	152	113	213	113	152	M	152
3401	0105	9,119	61,000	70,119	8	8,603	501	-	7	-	-	128	C	03-01 02-28	100	1538	-	1538	1538	1538	1538	2151	1538	3010	1518	2151	M	2096
3402	0106	25	3,800	3,825	-	-	25	-	-	-	-	1	C	03-01 02-28	100	3	-	3	3	3	3	3	3	3	1	3	C	8
3403	0107	4	800	804	-	-	4	-	-	-	-	1	C	03-01 02-28	100	1	-	1	1	1	1	1	1	1	1	1	C	1
3404	0108	27	2,556	2,583	-	-	27	-	-	-	-	1	C	03-01 02-28	100	12	-	12	12	12	12	12	12	12	6	12	C	6
3405	0109	398	5,745	6,143	37	361	-	-	-	-	-	13	C	03-01 02-28	100	50	-	50	50	50	50	50	50	50	35	50	C	35
3406	0110	339	14,000	14,339	-	339	-	-	-	-	-	5	C	03-01 02-28	100	68	-	68	68	68	68	68	68	68	68	68	C	93
3407	0069	762	389	1,151	-	684	78	-	-	-	-	12	C	03-01 02-28	100	139	-	139	139	139	139	172	139	241	136	172	M	164
3408	0066	1,699	20,400	22,099	-	1,048	651	-	-	-	-	23	C	03-01 02-28	100	277	-	277	277	277	277	395	277	553	253	395	M	330
3409	0047	80	3,541	3,621	-	64	-	-	16	-	-	1	C	03-01 02-28	100	16	-	16	16	16	16	16	16	16	15	16	C	15
3410	0684	88	1,520	1,608	-	-	88	-	-	-	-	2	C	03-01 02-28	100	21	-	21	21	21	21	21	21	21	13	21	C	13
3411	0685	40	300	340	-	10	30	-	-	-	-	1	C	03-01 02-28	100	6	-	6	6	6	6	6	6	6	5	6	C	6
3412	0707	80	640	720	-	-	80	-	-	-	-	2	C	03-01 02-28	100	28	-	28	28	28	28	28	28	28	11	28	C	11
3413	0708	50	240	290	-	50	-	-	-	-	-	1	C	03-01 02-28	100	14	-	14	14	14	14	14	14	14	14	14	C	15
3414	0710	200	560	760	-	160	40	-	-	-	-	2	C	03-01 02-28	100	26	-	26	26	26	26	26	26	26	25	26	I	38
3415	0711	20	80	100	-	20	-	-	-	-	-	1	C	03-01 02-28	100	4	-	4	4	4	4	4	4	4	4	4	C	5
3417	0640	99	640	739	-	13	67	19	-	-	-	1	C	03-01 02-28	100	16	-	20	20	20	20	20	20	20	17	20	C	18
3418	0641	1,600	5,120	6,720	29	1,093	465	-	13	-	-	10	C	03-01 02-28	100	123	-	123	123	123	123	287	123	398	110	287	M	252
3419	0098	15	80	95	-	-	15	-	-	-	-	1	C	03-01 02-28	100	3	-	3	3	3	3	3	3	3	0	3	C	T
3421	0252	649	640	1,289	-	48	601	-	-	-	-	8	C	03-01 02-28	100	101	-	101	101	101	101	173	101	242	77	173	I	109
3430	0151	720	10,741	11,461	-	523	197	-	-	-	-	15	C	03-01 02-28	100	178	-	178	178	178	178	178	178	178	171	178	C	182
3432	0153	2,001	34,034	36,033	-	648	1,218	19	116	-	-	30	C	03-01 02-28	100	358	-	358	358	358	358	358	358	358	312	358	C	318
3433	0154	154	4,738	4,892	-	154	-	-	-	-	-	4	C	03-01 02-28	100	42	-	42	42	42	42	42	42	42	42	42	C	45
3434	0155	100	646	746	-	50	50	-	-	-	-	2	C	03-01 02-28	100	20	-	20	20	20	20	20	20	20	10	20	C	23
3435	0157	320	3,113	3,433	-	157	163	-	-	-	-	3	C	03-01 02-28	100	31	-	31	31	31	31	31	31	31	26	31	C	65
3436	0158	2,391	7,742	10,133	-	1,900	491	-	-	-	-	35	C	03-01 02-28	100	429	-	429	429	429	429	669	429	936	407	669	M	611
3437	0159	6,195	12,892	19,087	-	3,909	1,134	-	560	592W	-	62	C	03-01 02-28	100	750	-	1701	1701	1701	1701	1284	1701	1723	1192	1284	M	1192
												88	Y	06-01 09-15	080	246	62	-										
												220	S	05-01 09-30	088	194	26	-										
												250	Y	05-01 06-06	088	264	36	-										
												300	S	05-01 09-30	080	240	60	-										
3438	0160	181	7,677	7,858	-	151	30	-	-	-	-	4	C	03-01 02-28	100	52	-	52	52	52	52	52	52	52	51	52	C	181
3439	0161	1,902	17,593	19,495	83	1,797	-	-	22	-	-	44	C	03-01 02-28	100	527	-	527	527	527	527	469	527	644	469	527	M	469
3440	0162	6,596	9,370	15,966	-	4,572	1,307	-	11	706W	-	26	C	03-01 02-28	100	308	-	1137	1137	1137	1137	1145	1137	1531	1066	1145	M	1066
												53	Y	05-01 08-31	037	78	134	-										
												100	C	06-01 09-30	037	148	252	-										
												150	C	05-16 09-30	037	250	425	-										
												825	S	04-16 10-15	037	366	624	-										
3441	0163	445	3,183	3,628	-	445	-	-	-	-	-	9	C	03-01 02-28	100	119	-	119	119	119	119	119	119	119	119	119	C	128
3442	0164	7,579	20,409	27,988	-	3,936	3,636	-	7	-	-	10	H	03-01 02-28	018	22	98	1729	1729	1729	1729	1668	1729	2335	1327	1668	I	1327
												790	C	03-01 02-28	018	1707	7773	-										
3443	0165	75	6,623	6,698	-	-	75	-	-	-	-	2	C	03-01 02-28	100	30	-	30	30	30	30	30	30	30	15	30	C	15
3444	0166	1,224	2,313	3,537	52	1,125	47	-	-	-	-	20	C	03-01 02-28	100	248	-	248	248	248	248	216	248	297	212	243	M	212
3445	0167	5,350	12,535	17,885	237	4,822	291	-	-	-	-	95	C	03-01 02-28	100	1167	-	1167	1167	1167	1167	1524	1167	2098	1154	1524	M	1490
3446	0168	48	2,229	2,277	-	-	48	-	-	-	-	1	C	03-01 02-28	100	15	-	15	15	15	15	15	15	15	6	15	C	6
3447	0169	2,610	8,363	10,973	-	607	1,993	-	2	-	8(A)	50	C	03-01 02-28	100	604	-	604	604	604	604	637	604	891	435	631	I	435
3448	0170	80	1,739	1,819	-	80	-	-	-	-	-	2	C	03-01 02-28	100	27	-	27	27	27	27	27	27	27	22	27	C	22
3449	0171	640	13,883	14,523	42	500	98	-	-	-	-	10	C	03-01 02-28	100	123	-	123	123	123	123	123	123	123	119	123	C	131
3450	0172	1,527	4,256	5,783	53	1,110	356	-	-	-	8(A)	32	C	03-01 02-28	100	388	-	388	388	388	388	407	388	564	366	407	M	366
3451	0173	519	6,116	6,635	-	294	225	-	-	-	-	7	C	03-01 02-28	100	92	-	92	92	92	92	92	92	92	69	74	C	72

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use	%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																			ST	LT	ST	LT	ST	LT	ST	LT		
3452	0174	40	1,340	1,380	-	40	-	-	-	-	-	1	C	03-01 02-28	100	9	-	9	9	9	9	9	9	9	9	9	C	12
3453	0175	1,944	3,507	5,451	-	79	1,865	-	-	-	-	2	C	03-01 02-28	100	20	-	340	340	340	340	309	340	432	190	309	I	190
					-			-	-	-	-	650	S	04-15 04-30	044	31	38	-										
					-			-	-	-	-			07-01 11-30	044	289	361	-										
3454	0733	397	1,520	1,917	-	375	22	-	-	-	-	4	C	03-01 02-28	100	51	-	51	51	51	51	99	51	138	50	99	M	96
3455	0177	8,133	9,356	17,489	-	5,064	3,054	13	2	-	-	19	C	03-01 02-28	100	227	-	1495	1495	1495	1495	1558	1495	2180	1260	1495	M	1260
												100	Y	06-01 11-01	046	173	203	-										
												134	C	06-01 11-01	046	308	362	-										
												400	Y	05-10 11-01	046	787	923	-										
3456	0178	80	1,520	1,600	-	18	50	-	12	-	-	1	C	03-01 02-28	100	14	-	14	14	14	14	14	14	14	12	14	C	13
3457	0179	720	10,161	10,881	-	720	-	-	-	-	-	12	C	03-01 02-28	100	147	-	147	147	147	147	147	147	147	106	147	C	106
3458	0181	8,739	7,632	16,371	-	6,197	2,297	-	245	-	-	400	C	03-01 02-28	040	1926	2880	2284	2284	2284	2284	2349	2284	3288	2092	2349	M	2092
3459	0182	422	2,013	2,435	-	327	95	-	-	-	-	9	C	03-01 02-28	100	112	-	112	112	112	112	112	112	157	101	112	M	101
3460	0183	2,881	8,213	11,094	-	2,306	578	-	-	-	-	41	C	03-01 02-28	100	498	-	498	498	498	498	773	498	1083	473	773	M	704
	0309	1,298	1,952	3,250	-	1,051	264	-	-	-	-	16	C	03-01 02-28	100	190	-	190	190	190	190	294	190	412	180	294		268
	0696	63	0	63	-	34	9	-	-	-	-	1	C	03-01 02-28	100	11	-	11	11	11	11	22	11	30	11	22		20
3461	0184	640	3,360	4,000	-	348	292	-	-	-	-	5	C	03-01 02-28	100	67	-	67	67	67	67	67	67	67	54	67	C	117
3462	0185	2,215	3,916	6,131	-	2,190	-	-	25	-	-	5	C	03-01 02-28	100	60	-	513	513	513	513	447	513	626	447	513	M	447
												8	Y	07-01 09-15	82	16	4											
												13	C	03-01 02-28	100	156	-											
												31	C	06-01 07-15	82	39	8											
												67	C	07-16 09-15	82	110	24											
												450	S	06-15 07-09	82	62	13											
														11-01 11-30	82	74	16											
3463	0186	6,359	7,754	14,113	1	6,305	35	-	18	-	-	11	C	03-01 02-28	100	130	-	1,142	1,142	1,142	1,421	1,101	1,142	1,541	1,097	1,101	M	1,097
												240	C	07-20 11-30	80	838	210											
3464	0187	5,188	8,726	13,914	-	569	4,380	2	18	219W	-	150	C	05-15 09-20	74	466	164	1,104	1,104	1,104	1,104	1,238	1,104	1,698	815	1,216	M	824
												401	C	03-01 02-28	12	577	4235											
3465	0188	80	2,159	2,239	-	44	36	-	-	-	-	2	C	03-01 02-28	100	26	-	26	26	26	26	26	26	26	20	26	C	20
3466	0189	5,246	5,923	11,169	1,130	4,076	40	-	-	-	-	4	C	03-01 02-28	100	44	-	956	956	956	956	1488	956	1938	955	1488	M	1,484
												295	C	05-01 12-11	42	912	1261											
3467	0190	3,422	13,741	17,163	687	2,512	223	-	-	-	-	4	C	03-01 02-28	100	48	-	525	525	525	525	829	525	1077	517	829	M	806
												15	C	03-01 02-28	100	181	-											
												51	C	03-01 02-28	48	296	316											
3468	0191	120	4,800	4,920	-	120	-	-	-	-	-	2	C	03-01 02-28	100	25	-	32	32	32	32	32	32	32	29	32	C	29
3469	0192	131	1,560	1,691	-	131	-	-	-	-	-	3	C	03-01 02-28	100	35	-	35	35	35	35	35	35	35	35	35	C	39
3470	0193	2,040	12,101	14,141	-	1,356	672	12	-	-	-	30	C	03-01 02-28	100	365	-	365	365	365	365	404	365	566	332	404	M	332
3471	0194	6,740	8,264	15,004	-	6,165	550	-	25	-	-	8	C	03-01 02-28	100	92	-	1,341	1,341	1,341	1,341	1,069	1,341	1,496	1,032	1,069	M	1,032
												495	C	06-01 10-15	56	1249	979											
3472	0195	160	1,600	1,760	-	82	78	-	-	-	-	1	C	03-01 02-28	100	8	-	8	8	8	8	3	8	8	5	8	C	31
3473	0196	494	1,719	2,213	-	31	455	-	-	-	8A	2	C	03-01 02-28	100	26	-	88	88	88	88	125	88	175	65	125	M	77
												12	C	05-16 10-15	100	62	-											
3475	0198	120	2,351	2,471	-	120	-	-	-	-	-	2	C	03-01 02-28	100	25	-	25	25	25	25	25	25	25	25	25	C	36
3476	0199	1,040	3,850	4,890	-	1,003	37	-	-	-	-	22	C	03-01 02-28	100	272	-	272	272	272	272	279	272	390	270	279	M	274
3477	0200	160	2,636	2,796		160	-	-	-	-	-	3	C	03-01 02-28	100	40	-	40	40	40	40	40	40	40	40	40	C	41
	0731	52	2,095	2,147	-	-	46	6	-	-	-	1	C	03-01 02-28	100	16	-	16	16	16	16	16	16	16	14	16		14
3478	0201	8,942	9,380	18,322	-	8,816	126	-	-	-	-	21	C	03-01 02-28	100	254	-	1,992	1,992	1,992	1,992	2,501	1,992	3,510	1,986	2,501	I	2,491
												503	C	05-01 10-31	57	1719	1,299											
3479	0202	164	3,880	4,044	-	124	40	-	-	-	-	15	S	03-01 02-28	100	39	-	39	39	39	39	39	39	39	37	39	C	43

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use	%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																			ST	LT	ST	LT	ST	LT	ST	LT		
3480	0422	2,522	4,815	7,337	-	2,522	-	-	-	-	-	5	C	03-01 02-28	100	55	-	452	452	452	452	522	452	730	452	522	M	522
												5	C	03-01 02-28	100	57	-											
												80	C	05-05 10-15	66	283	144											
												112	S	06-20 10-15	66	57	27											
	0459	200	1,933	2,133	-	200	-	-	-	-	-	3	C	03-01 02-28	100	40	-	40	40	40	40	41	40	58	40	41		41
3481	0203	862	324	1,186	148	628	86	-	-	-	-	48	C	03-01 02-28	19	110	466	110	110	110	110	226	110	300	107	226	M	215
	0693	1,456	1,000	2,456	250	1,060	146	-	-	-	-	30	C	10-15 12-20	100	66	-	323	323	323	323	382	323	506	317	382		364
												112	C	03-01 02-28	19	257	1,087											
3482	0204	3,260	8,356	11,616	-	1,266	1,847	-	147	-	-	62	C	03-01 02-28	100	740	-	740	740	740	740	632	740	886	476	632	I	476
3483	0205	113	3,212	3,325	-	73	40	-	-	-	-	3	C	03-01 02-28	100	36	-	36	36	36	36	36	36	36	25	36	C	25
3484	0206	120	1,460	1,580	-	40	80	-	-	-	-	2	C	03-01 02-28	100	30	-	30	30	30	30	30	30	30	26	30	C	28
3485	0207	240	1,600	1,840	-	240	-	-	-	-	-	5	C	03-01 02-28	100	60	-	60	60	60	60	60	60	60	60	60	C	62
3486	0208	40	3,440	3,480	-	40	-	-	-	-	-	1	C	03-01 02-28	100	8	-	8	8	8	8	8	8	8	8	8	C	9
3487	0209	40	1,720	1,760	-	40	-	-	-	-	-	1	C	03-01 02-28	100	10	-	10	10	10	10	10	10	10	10	10	C	10
	0636	40	4,609	4,649	-	40	-	-	-	-	-	1	C	03-01 02-28	100	8	-	8	8	8	8	8	8	8	8	8		10
3488	0210	280	7,567	7,847	-	276	-	-	4	-	-	6	C	03-01 02-28	100	72	-	72	72	72	72	72	72	72	72	72	C	71
	0627	200	3,400	3,600	-	197	-	-	3	-	-	3	C	03-01 02-28	100	30	-	30	30	30	30	30	30	30	30	30		53
3489	0211	880	5,230	880	-	880	-	-	-	-	-	90	S	03-01 02-28	100	215	-	215	215	215	215	215	215	215	140	215	C	140
3490	0212	1,239	13,474	14,713	-	260	968	-	11	-	-	18	C	03-01 02-28	100	216	-	216	216	216	216	216	216	216	175	216	C	222
3491	0214	207	13,249	13,456	-	207	-	-	-	-	-	5	C	03-01 02-28	100	58	-	58	58	58	58	58	58	58	56	58	C	56
3492	0215	2,596	5,650	8,252	-	2,537	59	-	-	-	-	2700	S	03-01 02-28	10	648	5,832	648	648	648	648	636	648	891	628	636	M	628
3493	0216	2,336	4,515	6,851	673	884	767	-	12	-	-	5	C	03-01 02-28	100	59	-	473	473	473	473	537	473	688	445	537	M	445
												120	C	06-15 11-13	070	414	178											
3494	0218	120	960	1,080	-	120	-	-	-	-	-	15	S	03-01 02-28	100	40	-	40	40	40	40	40	40	40	34	40	C	34
3495	0219	160	1,920	2,080	-	160	-	-	-	-	-	15	S	03-01 02-28	100	42	-	42	42	42	42	42	42	42	35	42	C	35
3496	0220	6,564	12,163	18,727	-	4,506	2,058	-	-	-	-	107	C	03-01 02-28	100	1288	-	1,288	1,288	1,288	1,288	1,834	1,288	2,567	1,206	1,834	M	1,602
3497	0221	4,572	10,113	14,685	-	2,618	1,643	43	268	-	-	64	C	03-01 02-28	100	771	-	771	771	771	771	909	771	1,273	714	909	I	749
3498	0222	1,330	4,650	5,980	-	1,116	214	-	-	-	-	19	C	03-01 02-28	100	227	-	227	227	227	227	345	227	484	216	345	M	321
3499	0224	10,599	12,828	23,427	-	7,711	1,620	-	339	929W	-	1	C	03-01 02-28	100	13	-	2,275	2,275	2,275	2,275	2,220	2,275	2,923	2,090	2,220	I	2,090
												4	C	03-01 02-28	100	51	-											
												22	C	03-01 02-28	100	265	-											
												304	C	05-16 10-15	082	1244	276											
												309	C	05-16 11-15	041	753	1,101											
3500	0223	2,118	17,475	19,593	335	1,639	144	-	-	-	-	36	C	03-01 02-28	100	428	-	428	428	428	428	513	428	677	421	513	M	495
3501	0225	1,180	8,519	9,699	-	593	587	-	-	-	-	9	C	03-01 02-28	100	108	-	108	108	108	108	108	108	108	87	108	C	192
3502	0226	720	4,960	5,680	169	551	-	-	-	-	-	12	C	03-01 02-28	100	144	-	144	144	144	144	144	144	144	144	144	C	174
3503	0227	680	1,800	2,480	428	212	40	-	-	-	-	11	C	03-01 02-28	100	130	-	130	130	130	130	130	130	130	128	130	C	188
3504	0228	160	3,692	3,852	78	82	-	-	-	-	-	3	C	03-01 02-28	100	33	-	33	33	33	33	33	33	33	33	33	C	51
3505	0229	150	1,395	1,545	-	150	-	-	-	-	-	4	C	03-01 02-28	100	43	-	43	43	43	43	43	43	43	43	43	C	45
3506	0230	120	640	760	-	29	91	-	-	-	-	2	C	03-01 02-28	100	30	-	30	30	30	30	30	30	30	21	30	C	21
3507	0231	220	3,112	3,330	-	-	220	-	-	-	-	20	S	03-01 02-28	100	55	-	55	55	55	55	36	55	56	22	26	I	22
3508	0232	11,699	17,868	29,567	-	10,021	1,678	-	-	-	-	64	Y	03-01 02-28	100	768	-	2,465	2,465	2,465	2,465	2,062	2,465	2,888	1,916	2,040	M	1,916
												127	C	03-01 02-28	100	1524	-											
												135	S	03-01 02-28	100	324	-											
3509	0233	280	6,718	6,998	-	200	80	-	-	-	-	5	C	03-01 02-28	100	66	-	66	66	66	66	66	66	66	45	66	C	45
3510	0234	6,068	5,370	11,438	-	5,519	549	-	-	-	-	102	C	03-01 02-28	100	1231	-	1,231	1,231	1,231	1,231	924	1,231	1,293	874	909	M	874
3511	0235	240	1,541	1,781	-	240	-	-	-	-	-	2	C	03-01 02-28	100	23	-	23	23	23	23	23	23	23	23	23	C	26
3512	0236	3,183	5,570	8,753	348	1,916	919	-	-	-	-	34	C	03-01 02-28	100	404	-	404	404	404	404	727	404	977	370	727	M	639
3513	0237	1,806	3,683	5,489	-	1,008	798	-	-	-	-	32	C	03-01 02-28	100	386	-	386	386	386	386	517	386	724	352	517	M	427

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use	%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																			ST	LT	ST	LT	ST	LT	ST	LT		
3514	0238	4,990	11,565	16,555	-	4,135	855	-	-	-	-	38	C	03-01 02-28	100	450	-	989	989	989	989	1126	989	1577	959	1126	M	1035
												40	Y	08-10 10-31	32	35	66											
												121	C	06-10 10-31	32	183	386											
												1000	S	05-15 10-15	32	320	680											
3515	0239	40	2,280	2,320	-	40	-	-	-	-	-	5	S	03-01 02-28	100	10	-	10	10	10	10	10	10	10	10	10	C	11
3516	0240	40	2,152	2,192	-	40	-	-	-	-	-	1	C	03-01 02-28	100	10	-	10	10	10	10	10	10	10	10	10	C	11
3517	0241	360	1,440	1,800	-	360	-	-	-	-	-	7	C	03-01 02-28	100	87	-	87	87	87	87	87	87	87	87	87	C	99
3518	0242	1,360	1,907	3,267	52	1,308	-	-	-	-	-	29	C	03-01 02-28	100	347	-	347	347	347	347	364	347	503	347	364	M	364
3519	0243	868	2,375	3,243	-	679	189	-	-	-	-	10	C	03-01 02-28	100	119	-	119	119	119	119	246	119	345	90	226	M	223
3520	0244	80	2,064	2,144	-	30	50	-	-	-	-	1	C	03-01 02-28	100	6	-	6	6	6	6	6	6	6	4	6	C	13
3521	0245	3,869	7,547	11,416	-	3,766	85	-	18	-	-	100	S	03-01 02-28	19	46	194	734	734	734	734	1032	734	1445	732	1032	M	1025
												286	C	03-01 02-28	19	652	2780											
3522	0246	2,158	3,360	5,518	-	1,214	857	-	-	87 B	-	51	C	03-01 02-28	100	610	-	610	610	610	610	618	610	831	535	617	I	535
3523	0247	1,527	4,663	6,190	-	573	954	-	-	-	-	14	C	03-01 02-28	100	172	-	172	172	172	172	311	172	435	137	311	I	217
3524	0248	40	3,926	3,966	-	-	40	-	-	-	-	1	C	03-01 02-28	100	7	-	7	7	7	7	7	7	7	5	7	C	8
3526	0250	180	2,640	2,820	20	68	92	-	-	-	-	3	C	03-01 02-28	100	39	-	39	39	39	39	39	39	39	35	39	C	40
3527	0251	15	232	247	-	15	-	-	-	-	-	1	C	03-01 02-28	100	4	-	4	4	4	4	4	4	4	4	4	C	6
3528	0642	40	840	880	-	40	-	-	-	-	-	1	C	03-01 02-28	100	10	-	10	10	10	10	10	10	10	10	10	C	12
3529	0253	2,062	2,299	4,361	42	1,660	360	-	-	-	-	34	C	03-01 02-28	100	407	-	407	407	407	407	547	407	760	393	547	M	510
3530	0254	1,572	2,458	4,030	112	1,460	-	-	-	-	-	20	C	03-01 02-28	100	244	-	244	244	244	244	454	244	621	244	454	M	454
3531	0255	101	16	117	-	76	-	-	25	-	-	1	C	03-01 02-28	100	16	-	16	16	16	16	16	16	16	16	16	C	21
3532	0256	40	1,640	1,680	-	40	-	-	-	-	-	1	C	03-01 02-28	100	13	-	13	13	13	13	13	13	13	10	13	C	10
3533	0257	240	4,871	5,111	-	240	-	-	-	-	-	4	C	03-01 02-28	100	55	-	55	55	55	55	55	55	55	55	55	C	67
3534	0258	120	960	1,080	-	95	25	-	-	-	-	4	C	03-01 02-28	100	48	-	48	48	48	48	48	48	48	33	48	C	33
3535	0259	311	1,600	1,911	-	311	-	-	-	-	-	5	C	03-01 02-28	100	64	-	64	64	64	64	64	64	64	64	64	C	72
3536	0260	240	1,600	1,840	-	240	-	-	-	-	-	4	C	03-01 02-28	100	52	-	52	52	52	52	52	52	52	52	52	C	69
3537	0261	288	3,533	3,821	-	22	266	-	-	-	-	5	C	03-01 02-28	100	59	-	59	59	59	59	59	59	59	35	59	C	35
3538	0262	160	1,840	2,000	-	160	-	-	-	-	-	4	C	03-01 02-28	100	48	-	48	48	48	48	48	48	48	48	48	C	49
3539	0263	6,613	22,018	28,631	755	5,359	493	-	6	-	-	95	C	03-01 02-28	100	1141	-	1,141	1,141	1,141	1,141	1,675	1,141	2,262	1,120	1,675	M	1,619
Com Allot		659																										
3540	0264	576	9,589	10,165	-	304	272	-	-	-	-	14	C	03-01 02-28	100	168	-	168	168	168	168	168	168	168	135	168	C	135
3541	0265	40	1,905	1,945	-	40	-	-	-	-	-	1	C	03-01 02-28	100	12	-	12	12	12	12	12	12	12	12	12	C	12
3542	0266	25	1,670	1,695	-	25	-	-	-	-	-	1	C	03-01 02-28	100	2	-	2	2	2	2	2	2	2	2	2	C	7
3543	0267	40	320	360	-	32	-	-	-	8 B	-	1	C	03-01 02-28	100	12	-	12	12	12	12	12	12	12	11	12	C	11
3544	0268	161	1,600	1,761	-	161	-	-	-	-	-	3	C	03-01 02-28	100	37	-	37	37	37	37	37	37	37	37	37	C	42
3545	0269	80	7,922	8,002	-	-	80	-	-	-	-	1	C	03-01 02-28	100	16	-	16	16	16	16	16	16	16	13	16	C	14
3546	0270	5,058	8,474	13,532	-	2,610	2,448	-	-	-	-	24	C	03-01 02-28	100	291	-	961	872	872	872	1,110	872	1,554	872	1,110	I	872
												150	C	06-01 09-15	067	351	174											
												300	S	06-01 08-30	067	121	59											
														09-09	100	198	-											
3547	0271	610	7,807	8,417	5	605	-	-	-	-	-	41	S	03-01 02-28	100	98	-	98	98	98	98	98	98	98	98	98	C	148
3548	0272	1,489	12,295	13,784	-	1,294	185	-	10	-	-	29	C	03-01 02-28	100	351	-	351	351	351	351	351	351	351	343	351	C	402
3549	0273	1,877	12,782	14,609	84	1,739	4	-	-	-	-	1	C	03-01 02-28	100	8	-	245	245	245	245	245	245	245	245	245	C	562
	0273	639			75	563	1	-	-	-	-	6	C	03-01 02-28	100	69												
												20	C	03-01 02-28	100	168	-											
3550	0682	2,240	8,958	11,198	140	1,543	536	16	5	-	-	27	C	03-01 02-28	100	326	-	326	326	326	326	512	326	703	305	512	M	458
	0683	1,440	11,557	12,997	89	994	342	11	4	-	-	13	C	03-01 02-28	100	160	-	160	160	160	160	327	160	449	150	327		292
3551	0274	670	197	867	457	161	52	-	-	-	-	4	C	03-01 02-28	100	44	-	44	44	44	44	177	44	199	42	177	M	173
3552	0574	10,259	30,635	40,894	1,849	6,746	1,444	8	212	-	-	14	C	03-01 02-28	100	167	-	2,406	2,406	2,406	2,406	2,430	2,406	3,192	2,289	2,430	M	2,289
												1103	C	05-01 11-30	29	2239	5,482											
3553	0276	184	3,702	3,886	-	22	162	-	-	-	-	4	C	03-01 02-28	100	44	-	44	44	44	44	44	44	44	26	44	C	26

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use	%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt 8		Alt C		Alt D		M C I	Current Prod. AUMs
																			ST	LT	ST	LT	ST	LT	ST	LT		
3554	0277	80	2,200	2,280	-	80	-	-	-	-	-	1	C	03-01 02-28	100	18	-	18	18	18	18	18	18	18	18	18	C	22
	0278	200	990	1,190	-	200	-	-	-	-	-	4	C	03-01 02-28	100	50	-	50	50	50	50	50	50	50	50	50		53
3556	0279	80	2,000	2,080	-	-	80	-	-	-	-	2	C	03-01 02-28	100	23	-	23	23	23	23	23	23	23	15	23	C	15
3557	0280	1,602	6,641	8,243	-	1,252	350	-	-	-	-	6	S	03-01 02-28	100	16	-	281	281	281	281	238	281	334	210	238	M	210
												117	S	03-01 02-28	100	281	-											
3558	0281	1,193	6,173	7,366	-	1,193	-	-	-	-	-	14	C	03-01 02-28	100	169	-	169	169	169	169	197	169	276	169	197	M	197
3559	0282	640	1,528	2,168	-	410	230	-	-	-	-	9	C	03-01 02-28	100	115	-	115	115	115	115	128	115	180	105	128	M	105
3560	0283	800	1,520	2,320	-	624	176	-	-	-	-	9	C	03-01 02-28	100	114	-	114	114	114	114	217	114	303	107	217	M	199
3561	0423	6,212	8,305	14,357	-	5,734	136	-	-	342W	-	360	C	03-01 02-28	020	864	3,456	1,470	1,470	1,470	1,470	1,436	1,470	1,942	1,425	1,436	M	1,425
												1200	S	03-01 02-28	020	576	2,304											
3562	0643	80	3,636	3,716	-	10	70	-	-	-	-	2	C	03-01 02-28	100	22	-	22	22	22	22	22	22	22	15	22	C	15
3563	0285	675	2,997	3,672	-	121	465	-	-	89W	-	25	C	03-01 02-28	017	51	249	219	219	219	219	219	219	219	90	219	C	90
												412	S	03-01 02-28	017	168	821											
3564	0286	213	320	533	-	27	41	-	-	145W	-	3	C	03-01 02-28	100	40	-	40	40	40	40	40	40	40	39	40	C	54
3565	0287	2,062	3,974	6,036	-	1,371	691	-	-	-	-	15	C	03-01 02-28	100	183	-	183	183	183	183	434	183	607	161	434	M	373
3566	0288	160	419	579	-	54	106	-	-	-	-	1	C	03-01 02-28	100	16	-	16	16	16	16	16	16	16	12	16	C	29
3567	0289	40	4,520	4,560	-	-	40	-	-	-	-	1	C	03-01 02-28	100	4	-	4	4	4	4	4	4	4	2	4	C	8
3568	0291	310	3,604	3,914	-	205	105	-	-	-	-	6	C	03-01 02-28	100	72	-	72	72	72	72	72	72	72	67	72	C	73
3569	0292	384	2,027	2,411	-	350	34	-	-	-	-	6	C	03-01 02-28	100	73	-	73	73	73	73	68	73	96	65	68	M	65
3570	0293	1,215	1,960	3,175	-	1,009	206	-	-	-	-	23	C	03-01 02-28	100	271	-	271	271	271	271	350	271	491	263	350	M	329
3571	0294	202	1,342	1,544	-	42	160	-	-	-	-	28	S	03-01 02-28	100	67	-	67	67	67	67	67	67	67	32	67	C	32
3572	0295	2,899	2,400	5,299	-	1,674	1,225	-	-	-	-	738	S	03-01 02-28	028	496	1,275	496	496	496	496	432	496	606	353	432	I	353
3573	0296	1,670	2,583	4,253	399	1,026	245	-	-	-	-	25	C	03-01 02-28	100	306	-	306	306	306	306	394	306	501	298	394	M	373
3574	0298	1,625	14,067	15,692	-	1,595	30	-	-	-	-	27	C	03-01 02-28	100	329	-	329	329	329	329	441	329	617	328	441	M	438
3575	0299	3,122	11,533	14,655	-	2,081	977	-	64	-	-	312	C	03-01 02-28	009	337	3,407	597	597	597	597	513	597	718	431	513	M	431
												1200	S	03-01 02-28	009	260	2,620											
3576	0300	1,697	3,250	4,947	-	908	709	-	-	-	80 A	23	C	03-01 02-28	100	281	-	281	281	281	281	414	281	579	255	414	I	341
3577	0301	80	5,680	5,760	-	80	-	-	-	-	-	1	C	03-01 02-28	100	14	-	14	14	14	14	14	14	14	14	14	C	23
3578	0302	34	2,735	2,769	-	25	9	-	-	-	-	1	C	03-01 02-28	100	7	-	7	7	7	7	7	7	7	7	7	C	7
3579	0303	8,089	28,134	36,223	3,223	4,648	218	-	-	-	-	88	C	03-01 02-28	100	1052	-	1,052	1,052	1,052	1,052	2,096	10,52	2,568	1,042	2,096	M	2,069
3580	0304	778	720	1,498	-	55	723	-	-	-	-	44	C	05-01 10-16	100	242	-	245	245	245	245	221	245	309	137	245	I	137
3581	0305	3,724	22,753	26,477	-	2,964	755	-	5	-	-	70	S	03-01 02-28	100	844	-	844	844	844	844	1,032	844	1,445	812	1,032	M	947
3582	0306	700	3,769	4,469	-	345	355	-	-	-	-	15	Y	03-01 02-28	100	143	-	143	143	143	143	143	143	143	96	143	C	96
3584	0308	1,508	4,441	5,949	-	917	591	-	-	-	-	105	S	03-01 02-28	100	255	-	255	255	255	255	252	255	353	223	252	M	223
3586	0310	2,080	4,546	6,626	-	141	1,939	-	-	-	-	246	S	03-01 02-28	100	592	-	592	592	592	592	587	592	821	367	587	I	367
3587	0176	6,233	2,487	8,720	-	6,010	223	-	-	-	-	100	C	03-01 02-28	021	251	949	1,224	1,224	1,224	1,224	1,035	1,224	1,459	1,022	1,035	M	1,022
												1930	S	03-01 02-28	021	973	3,659											
3588	0311	1,040	3,984	5,024	-	654	386	-	-	-	-	16	C	03-01 02-28	100	191	-	191	191	191	191	191	191	191	171	191	C	171
3589	0312	1,950	4,093	6,043	-	1,950	-	-	-	-	-	1	C	03-01 02-28	100	5	-	304	304	304	304	328	304	459	304	328	M	328
												259	C	09-01 10-20	050	216	216											
												300	S	05-15 07-15	050	61	61											
														10-10 11-01	050	22	22											
3590	0313	805	3,006	3,811	-	786	19	-	-	-	-	19	C	03-01 02-28	100	223	-	223	223	223	223	223	223	223	222	223	C	232
3591	0314	160	480	640	-	-	160	-	-	-	-	2	C	03-01 02-28	100	23	-	23	23	23	23	23	23	23	17	23	C	25
3592	0315	320	3,840	4,160	-	109	205	-	6	-	-	4	C	03-01 02-28	100	51	-	51	51	51	51	51	51	51	43	51	C	56
3593	0316	2,547	2,080	4,627	82	670	1,624	-	6	165C	-	120	C	06-01 09-30	099	476	480	476	476	476	476	422	476	561	307	422	I	307
3594	0317	40	2,659	2,699	-	-	40	-	-	-	-	1	C	03-01 02-28	100	8	-	8	8	8	8	8	8	8	6	8	C	6
3595	0318	160	4,513	4,673	-	160	-	-	-	-	-	1	C	03-01 02-28	100	16	-	16	16	16	16	16	16	16	16	16	C	31
3596	0319	1,670	4,928	6,598	-	1,316	351	-	3	-	-	36	C	03-01 02-28	100	156	-	156	156	156	156	156	156	156	143	156	C	249

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use	%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																			ST	LT	ST	LT	ST	LT	ST	LT		
3597	0320	775	7,442	8,217	-	448	327	-	-	-	-	16	C	03-01 02-28	100	189	-	189	189	189	189	189	189	189	163	189	C	163
3598	0321	493	2,805	3,298	-	103	371	19	-	-	-	6	C	03-01 02-28	100	72	-	72	72	72	72	72	72	72	57	72	C	57
3599	0322	120	4,169	4,289	-	120	-	-	-	-	-	2	C	03-01 02-28	100	28	-	28	28	28	28	28	28	28	28	28	C	29
3600	0323	520	3,838	4,358	-	492	28	-	-	-	-	8	C	03-01 02-28	100	100	-	100	100	100	100	100	100	100	99	100	C	109
3601	0324	414	3,427	3,841	-	117	297	-	-	-	-	9	C	03-01 02-28	100	108	-	108	108	108	108	108	108	108	74	108	C	74
3602	0325	2,423	13,506	15,929	-	920	1,492	-	11	-	-	47	C	03-01 02-28	100	563	-	563	563	563	563	637	563	891	476	637	M	480
	0715	2,935	9,794	12,729	-	1,115	1,806	-	14	-	-	54	C	03-01 02-28	100	652	-	652	652	652	652	747	652	1,047	551	747		564
3603	0326	4,314	19,736	24,050	-	1,179	3,124	-	11	-	-	57	C	03-01 02-28	100	680	-	1,684	1,684	1,684	1,684	1,046	1,684	1,464	732	1,046	I	732
												445	C	04-21 10-05	041	1004	1,444											
3604	0327	898	1,916	2,814	-	216	682	-	-	-	-	15	C	03-01 02-28	100	181	-	181	181	181	181	238	181	334	152	238	I	165
3605	0328	301	3,504	3,805	-	265	36	-	-	-	-	5	C	03-01 02-28	100	62	-	62	62	62	62	62	62	62	60	62	C	73
3606	0329	560	7,541	8,101	-	400	160	-	-	-	-	43	S	03-01 02-28	100	101	-	101	101	101	101	101	101	101	94	101	C	133
3607	0644	1,949	4,514	6,463	-	1,867	82	-	-	-	-	49	C	03-01 02-28	100	590	-	590	590	590	590	561	590	786	553	561	M	553
3608	0639	2,109	7,757	9,866	-	758	1,226	117	8	-	-	51	C	03-01 02-28	009	609	-	609	609	609	609	470	609	659	332	470	I	332
3609	0332	46	1,212	1,258	-	46	-	-	-	-	-	1	C	03-01 02-28	100	15	-	15	15	15	15	15	15	15	15	15	C	15
3610	0333	680	5,368	6,048	19	89	572	-	-	-	-	7	C	03-01 02-28	100	83	-	83	83	83	83	83	83	83	63	83	C	105
3611	0334	677	2,455	3,132	-	597	80	-	-	-	-	12	C	03-01 02-28	020	149	-	149	149	149	149	149	149	140	145	149	C	182
3612	0335	65	1,840	1,905	-	-	65	-	-	-	-	1	C	03-01 02-28	020	15	-	15	15	15	15	15	15	15	6	9	C	6
3613	0336	233	1,360	1,593	-	78	155	-	-	-	-	5	C	03-01 02-28	100	68	-	68	68	68	68	68	68	68	41	68	C	41
3614	0337	2,221	2,346	4,567	-	1,850	371	-	-	-	-	100	S	03-01 02-28	024	58	182	447	447	447	447	471	447	659	437	471	M	442
												130	C	03-01 02-28	024	374	1,186											
3615	0338	1,617	4,038	5,655	-	799	818	-	-	-	-	35	C	03-01 02-28	100	422	-	422	422	422	422	404	422	566	330	404	M	330
3616	0339	320	8,612	8,932	-	320	-	-	-	-	-	2	C	03-01 02-28	100	26	-	26	26	26	26	26	26	26	26	26	C	73
3617	0645	887	2,231	3,118	-	887	-	-	-	-	-	24	C	03-01 02-28	100	286	-	286	286	286	286	257	286	360	257	286	M	257
3618	0341	320	2,880	3,200	-	162	158	-	-	-	-	4	C	03-01 02-28	100	55	-	55	55	55	55	55	55	55	30	35	C	62
3619	0342	3,393	11,909	15,302	-	3,359	34	-	-	-	-	34	C	03-01 02-28	100	415	-	415	415	415	415	944	415	1,321	413	944	M	939
3620	0343	2,913	5,278	8,191	-	1,754	1,159	-	-	-	-	58	C	03-01 02-28	100	695	-	695	695	695	695	830	695	1,100	645	830	I	693
3621	0344	120	3,320	3,440	-	-	120	-	-	-	-	3	C	03-01 02-28	100	31	-	31	31	31	31	31	31	31	20	31	C	20
3622	0345	2,470	3,120	5,590	-	555	1,785	-	102	-	28A	14	C	03-01 02-28	100	175	-	424	424	424	424	602	424	843	321	602	I	405
												96	C	03-01 06-29	026	99	281											
														09-01 02-28	026	150	426											
3623	0346	600	4,027	4,627	-	600	-	-	-	-	-	13	C	03-01 02-28	100	150	-	150	150	150	150	150	150	150	150	150		
3624	0347	2,829	7,518	10,347	1,483	1,346	-	-	-	-	-	7	H	11-01 02-28	076	21	7	716	716	716	716	774	716	909	716	774	M	744
												10	C	03-01 02-28	100	117	-											
												30	C	06-01 09-30	076	91	29											
												74	C	10-01 12-31	076	170	52											
												260	S	05-01 07-31	076	119	37											
														10-01 02-28	076	198	62											
3625	0348	40	2,200	2,240	-	-	40	-	-	-	-	1	C	03-01 02-28	100	5	-	5	5	5	5	5	5	5	3	5	C	7
3627	0349	40	1,600	1,640	-	20	20	-	-	-	-	1	C	03-01 02-28	100	10	-	10	10	10	10	10	10	10	8	10	C	8
3628	0350	120	1,760	1,880	-	-	120	-	-	-	-	3	C	03-01 02-28	100	35	-	35	35	35	35	35	35	35	22	35	C	22
3629	0351	309	15,350	15,659	-	251	58	-	-	-	-	7	C	03-01 02-28	020	81	-	81	81	81	81	81	81	81	66	81	C	66
3630	0352	80	1,920	2,000	-	-	80	-	-	-	-	2	C	03-01 02-28	100	24	-	24	24	24	24	24	24	24	20	24	C	80
3631	0180	365	1,240	1,605	-	341	24	-	-	-	-	6	C	03-01 02-28	100	73	-	73	73	73	73	73	73	73	72	73	C	87
3632	0353	2,040	1,880	3,920	-	1,831	209	-	-	-	-	41	C	03-01 02-28	100	486	-	486	486	486	486	504	486	705	480	504	M	486
3633	0354	160	5,100	5,260	-	160	-	-	-	-	-	2	C	03-01 02-28	100	18	-	18	18	18	18	18	18	18	18	18	C	33
3634	0355	400	5,415	5,815	-	353	47	-	-	-	-	8	C	03-01 02-28	100	93	-	93	93	93	93	93	93	93	80	93	C	80
3635	0356	70	4,813	4,901	-	31	39	-	-	-	-	1	C	03-01 02-28	100	13	-	13	13	13	13	13	13	13	10	13	C	10
3636	0357	4,681	6,193	10,874	113	3,163	1,304	-	101	-	-	115	S	03-01 02-28	100	277	-	838	838	838	838	933	838	1296	793	933	I	812
												513	S	06-01 11-30	091	562	56											

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use	%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																			ST	LT	ST	LT	ST	LT	ST	LT		
3637	0358	2,576	3,392	5,968	-	716	1,860	-	-	-	-	61	C	03-01 02-28	100	727	-	727	727	727	727	681	727	954	469	681	I	469
3638	0359	2,768	1.639	4,407	-	567	1,891	-	310	-	-	10	C	03-01 02-28	100	120	-	570	570	570	570	639	570	895	427	639	I	437
												90	C	05-01 09-30	100	450	-											
3639	0360	2,400	3,494	5,894	36	522	1,842	-	-	-	-	65	C	03-01 02-28	100	781	-	781	781	781	781	639	781	891	435	639	I	435
3640	0361	40	2,218	2,258	-	-	18	-	22	-	-	1	C	03-01 02-28	100	3	-	3	3	3	3	3	3	3	3	3	C	2
3641	0362	320	2,982	3,302	-	320	-	-	-	-	-	4	C	03-01 02-28	100	50	-	50	50	50	50	50	50	50	50	50	C	92
3642	0363	7,345	7,253	14,598	-	6,874	471	-	-	-	-	2	H	03-01 02-28	031	7	17	1,297	1,297	1,297	1,297	1,183	1,297	1,656	1,144	1,183	M	1,144
												1484	S	03-01 02-28	031	1105	2,459											
3643	0364	209	2,267	2,476	-	30	179	-	-	-	-	6	C	03-01 02-28	100	69	-	69	69	69	69	69	69	69	38	69	C	38
3644	0365	840	3,477	4,317	-	218	577	-	5	-	40A	19	C	03-01 02-28	100	228	-	228	228	228	228	228	228	228	161	228	C	161
3645	0366	160	4,120	4,280	-	160	-	-	-	-	-	5	Y	03-01 02-28	100	46	-	46	46	46	46	46	46	46	46	46	C	49
3646	0367	150	8,555	8,705	-	150	-	-	-	-	-	10	S	03-01 02-28	100	24	-	24	24	24	24	24	24	24	24	24	C	26
3647	0368	10,933	10,894	21,827	-	7,340	2,473	-	48	1072	-	10	C	03-01 02-28	100	117	-	2,097	2,097	2,097	2,097	1,889	2,097	2,543	1,693	1,889	I	1,693
										C		100	C	07-20 09-25	087	191	25											
												1000	S	05-15 06-30	087	267	33											
												2000	S	07-01 07-20	087	232	32											
														21 09-25	087	754	98											
														09-26 11-10	087	522	78											
3649	0370	4,598	7,206	11,804	-	1,398	2,890	-	-	310W	-	17	C	03-01 02-28	100	207	-	761	761	761	761	875	761	1,188	594	831	I	660
												100	C	05-15 10-02	064	294	163											
												355	C	06-01 11-19	013	260	1,739											
3650	0371	120	2,073	2,193	-	-	120	-	-	-	-	3	C	03-01 02-28	100	32	-	32	32	32	32	32	32	32	22	32	C	22
3651	0372	320	1,720	2,040	-	145	155	-	20	-	-	30	S	03-01 02-28	100	72	-	72	72	72	72	72	72	72	51	72	C	51
3652	0373	200	1,568	1,768	-	183	17	-	-	-	-	5	C	03-01 02-28	100	57	-	57	57	57	57	57	57	57	50	57	C	50
3653	0374	640	11,760	12,400	-	472	168	-	-	-	-	14	C	03-01 02-28	100	168	-	168	168	168	168	186	168	260	160	186	M	165
3654	0375	120	4,320	4,440	-	-	106	-	14	-	-	2	C	03-01 02-28	100	22	-	22	22	22	22	22	22	22	14	22	C	14
3655	0377	40	515	555	-	-	40	-	-	-	-	1	C	03-01 02-28	100	10	-	10	10	10	10	10	10	10	6	10	C	6
3656	0378	315	8,134	8,449	-	283	32	-	-	-	-	8	C	03-01 02-28	100	96	-	96	96	96	96	96	96	96	56	96	C	56
3657	0379	4,414	9,692	14,106	-	3,905	509	-	-	-	-	68	C	03-01 02-28	100	816	-	816	816	816	816	884	816	1,237	778	861	M	844
3659	0381	40	3,040	3,080	-	40	-	-	-	-	-	1	C	03-01 02-28	100	13	-	13	13	13	13	13	13	13	9	13	C	9
3660	0382	400	1,832	2,232	-	25	375	-	-	-	-	5	C	03-01 02-28	100	60	-	60	60	60	60	60	60	60	49	60	C	54
3661	0383	2,615	4,357	6,972	-	1,208	1,385	-	-	22W	-	19	C	03-01 02-28	100	223	-	523	523	523	523	498	523	695	397	498	I	397
												230	S	05-15 08-14	100	138	-											
												270	S	06-01 08-31	100	162	-											
3662	0385	1,481	3,201	4,682	333	1,148	-	-	-	-	-	33	C	03-01 02-28	100	392	-	392	392	392	392	400	392	522	392	400	M	400
3663	0386	3,005	11,580	14,585	-	2,876	129	-	-	-	-	54	C	03-01 02-28	100	668	-	668	668	668	668	840	668	1,175	662	840	M	825
3664	0387	40	2,717	2,757	-	40	-	-	-	-	-	1	C	03-01 02-28	100	10	-	10	10	10	10	10	10	10	10	10	C	11
3665	0388	2,006	7,062	9,068	-	1,823	183	-	-	-	-	1	C	03-01 02-28	100	13	-	287	287	287	287	310	287	433	282	310	M	296
												4	C	03-01 02-28	100	51												
												5	C	03-01 02-28	100	59												
												15	C	03-01 02-28	100	177												
3666	0389	2,040	3,760	5,800	-	830	1,210	-	-	-	-	47	C	03-01 02-28	100	566	-	566	566	566	566	577	566	808	441	577	I	441
3667	0390	2,897	2,144	5,041	-	2,897	-	-	-	-	-	8	H	03-01 02-28	018	17	79	509	509	509	509	634	509	888	509	634	M	634
												40	C	03-01 02-28	018	86	394											
												940	S	03-01 02-28	018	406	1,850											
3668	0391	4,000	7,221	11,221	-	3,831	169	-	-	-	-	4	C	03-01 02-28	100	48	-	922	922	922	922	843	922	1,180	830	843	M	830
												80	C	03-01 11-30	035	250	467											
												1000	S	03-01 11-30	035	624	1,168											
3670	0393	303	3,796	4,099	-	-	102	-	-	201W	-	7	C	03-01 02-28	100	80	-	80	80	80	80	80	80	80	77	80	C	104
3671	0394	360	2,327	2,687	-	345	14	-	1	-	-	4	C	03-01 02-28	100	50	-	50	50	50	50	50	50	50	50	50	C	89
3672	0395	1,420	5,579	6,999	-	785	635	-	-	-	-	29	C	03-01 02-28	100	349	-	349	349	349	349	372	349	522	253	307	M	291
3673	0396	240	1,799	2,039	-	104	136	-	-	-	-	5	C	03-01 02-28	100	59	-	59	59	59	59	59	59	59	53	59	C	53

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use	%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																			ST	LT	ST	LT	ST	LT	ST	LT		
3674	0397	80	1,634	1,714	-	80	-	-	-	-	-	1	C	03-01 02-28	100	18	-	18	18	18	18	18	18	18	12	18	C	12
3675	0398	438	920	1,358	-	409	29	-	-	-	-	9	C	03-01 02-28	100	106	-	106	106	106	106	124	106	174	105	124	M	121
3676	0399	80	357	437	-	80	-	-	-	-	-	3	C	03-01 02-28	100	38	-	38	38	38	38	38	38	38	21	38	C	21
3677	0400	3,431	30,468	33,899	-	2,400	884	-	147	-	-	56	C	03-01 02-28	100	675	-	675	675	675	675	795	675	1,113	641	795	M	705
3678	0401	998	496	1,494	-	64	893	41	-	-	-	27	C	03-01 02-28	100	320	-	320	320	320	320	303	320	424	181	303	I	181
3679	0402	71	2,200	2,271	-	25	46	-	-	-	-	1	C	03-01 02-28	100	16	-	16	16	16	16	16	16	16	14	16	C	15
3680	0403	1,931	19,030	20,961	611	1,138	168	-	14	-	-	19	C	03-01 02-28	100	230	-	230	230	230	230	230	230	230	224	230	C	467
3681	0404	773	1,849	2,622	-	622	151	-	-	-	-	50	S	03-01 02-28	100	118	-	118	118	118	118	133	118	187	113	133	M	121
3682	0405	706	8,501	9,207	-	587	119	-	-	-	-	13	C	03-01 02-28	100	158	-	158	158	158	158	158	158	158	140	158	C	140
3683	0406	40	1,439	1,479	21	19	-	-	-	-	-	1	C	03-01 02-28	100	11	-	11	11	11	11	11	11	11	7	11	C	7
3684	0407	54	1,903	1,957	-	14	40	-	-	-	-	1	C	03-01 02-28	100	11	-	11	11	11	11	11	11	11	9	11	C	9
3685	0658	1,440	2,950	4,390	-	644	796	-	-	-	-	37	C	03-01 02-28	100	443	-	443	443	443	443	394	443	552	308	394	I	308
3686	0408	32	1,600	1,632	-	32	-	-	-	-	-	1	C	03-01 02-28	100	8	-	8	8	8	8	8	8	8	8	8	C	9
3687	0409	230	2,753	2,983	-	230	-	-	-	-	-	3	C	03-01 02-28	100	30	-	30	30	30	30	30	30	30	30	30	C	56
3688	0410	80	2,040	2,120	-	80	-	-	-	-	-	2	C	03-01 02-28	100	24	-	24	24	24	24	24	24	24	24	24	C	23
3689	0411	2,922	4,595	7,516	219	1,130	1,569	1	3	-	-	50	C	07-15 10-14	100	150	-	638	638	638	638	637	638	873	490	637	I	490
												64	C	05-15 10-14	053	169	149											
												910	S	05-15 10-14	035	319	584											
3690	0412	80	1,680	1,760	80	-	-	-	-	-	-	1	C	03-01 02-28	100	16	-	16	16	16	16	16	16	16	16	16	C	19
3691	0413	4,316	18,880	23,196	-	2,934	1,326	26	30	-	-	95	C	03-01 02-28	100	1135	-	1,135	1,135	1,135	1,135	1,142	1,135	1,598	982	1,142	M	982
3692	0414	700	2,160	2,860	-	670	30	-	-	-	-	28	C	06-01 09-20	024	25	76	168	168	168	168	168	168	179	124	128	M	124
												330	S	04-01 12-31	024	143	449											
3693	0415	20	520	540	-	20	-	-	-	-	-	2	S	03-01 02-28	100	6	-	6	6	6	6	6	6	6	3	3	C	3
3694	0416	320	2,732	3,052	-	155	165	-	-	-	-	4	C	03-01 02-28	100	45	-	45	45	45	45	45	45	45	38	45	C	55
3695	0417	1,075	2,360	3,435	-	802	273	-	-	-	-	16	C	03-01 02-28	100	199	-	199	199	199	199	202	199	283	174	202	M	174
3696	0419	10,207	12,992	12,992	-	9,683	321	-	128	-	75 A	290	S	03-01 02-28	100	692	-	1,925	1,925	1,925	1,925	1,817	1,925	1,544	1,792	1,817	M	1,792
												1800	S	06-15 09-28	062	774	461											
														11-01 12-24	068	441	193											
3697	0420	7,452	11,654	19,106	-	2,048	5,240	84	80	-	-	99	C	06-01 10-31	044	218	273	1,429	1,429	1,429	1,429	1,796	1,429	2,516	1,105	1,778	I	1,245
												411	C	06-01 10-31	019	469	1,586											
												510	C	03-01 05-31	019	291	1,239											
														11-01 02-28	019	388	1,652											
3698	0693	1,895	3,426	5,321	-	1,085	752	58	-	-	-	37	C	03-01 02-28	100	446	-	446	446	446	446	514	446	720	371	470	I	425
3699	0424	1,046	6,156	7,202	64	809	173	-	-	-	-	18	C	03-01 02-28	100	216	-	216	216	216	216	216	216	216	175	216	C	175
3702	0426	2,167	3,880	6,047	-	1,841	309	-	5	-	12 A	45	C	03-01 02-28	100	538	-	538	538	538	538	469	538	656	432	469	M	432
3703	0427	320	5,693	6,013	-	26	294	-	-	-	-	5	C	03-01 02-28	100	59	-	59	59	59	59	59	59	59	45	59	C	65
3704	0428	235	2,251	2,486	-	-	235	-	-	-	-	2	C	03-01 02-28	100	24	-	24	24	24	24	24	24	24	17	24	C	28
3705	0429	238	6,795	7,033	-	133	105	-	-	-	-	5	C	03-02 02-28	100	57	-	57	57	57	57	57	57	57	49	57	C	49
3706	0430	119	5,376	5,495	-	119	-	-	-	-	-	1	C	03-01 02-28	100	18	-	18	18	18	18	18	18	18	18	18	C	37
3707	0431	286	2,244	2,530	-	286	-	-	-	-	-	6	C	03-01 02-28	100	74	-	74	74	74	74	74	74	74	74	74	C	84
3708	0432	460	6,579	7,039	-	-	460	-	-	-	-	11	C	03-01 02-28	100	130	-	130	130	130	130	130	130	130	81	130	C	81
3709	0433	396	8,499	8,895	-	-	396	-	-	-	-	18	C	05-01 10-31	100	105	-	105	105	105	105	105	105	105	68	105	C	68
3710	0434	2,442	2,962	5,404	-	1,110	1,083	-	249	-	-	3	C	03-01 02-28	100	31	-	578	578	578	578	329	578	461	251	329	I	251
												274	C	07-01 08-31	100	547	-											
3711	0435	1,617	7,921	9,538	-	1,069	538	-	10	-	-	12	C	03-01 02-28	100	142	-	142	142	142	142	331	142	462	123	331	M	279
3712	0436	80	600	680	-	-	80	-	-	-	-	9	S	03-01 02-28	100	21	-	21	21	21	21	21	21	21	14	21	C	14
3713	0437	661	2,720	3,381	-	661	-	-	-	-	-	17	C	03-01 02-28	100	200	-	200	200	200	200	200	200	200	190	200	C	190
3715	0470	4,695	9,136	13,831	-	656	3,608	431	-	-	-	7	C	03-01 02-28	100	79	-	690	690	690	690	1,231	690	1,724	485	1,201	I	744
												147	C	05-15 10-14	083	611	120											
3716	0439	649	2,640	3,289	-	436	213	-	-	-	-	10	C	03-01 02-28	100	117	-	117	117	117	117	117	117	117	107	117	C	163
3717	0440	1,239	7,028	8,267	-	1,167	72	-	-	-	-	25	C	03-01 02-28	100	298	-	298	298	298	298	298	298	298	230	298	C	230

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use		%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																				ST	LT	ST	LT	ST	LT	ST	LT		
3718	0441	4,103	6,880	10,893	-	1,037	2,390	-	220	456W	-	8	C	03-01	02-28	100	95	-	786	786	786	786	1,008	786	1,363	730	1,008	I	750
												160	C	06-01	10-01	045	290	355											
3719	0442	1,219	3,240	4,459	-	512	707	-	-	-	-	30	C	03-01	02-28	100	357	-	357	357	357	357	333	357	465	248	333	I	248
3720	0443	277	9,263	9,540	-	277	-	-	-	-	-	2	C	03-01	02-28	100	20	-	20	20	20	20	20	20	20	20	20	C	37
3721	0444	639	13,735	14,374	-	544	95	-	-	-	-	9	C	03-01	02-28	100	105	-	105	105	105	105	105	105	105	101	105	C	148
3722	0445	1,508	14,888	16,396	-	1,443	65	-	-	-	-	10	C	03-01	02-28	100	120	-	120	120	120	120	120	120	120	118	120	C	246
3723	0447	320	3,760	4,080	-	38	282	-	-	-	-	5	C	03-01	02-28	100	56	-	56	56	56	56	56	56	56	45	56	C	59
3724	0252	200	2,120	2,320	-	181	19	-	-	-	-	4	C	03-01	02-28	100	50	-	50	50	50	50	50	50	50	49	50	C	54
	0448	320	3,850	4,170	-	290	30	-	-	-	-	7	C	03-01	02-28	100	82	-	82	82	82	82	82	82	82	80	82	-	87
3725	0449	40	1,880	1,920	-	-	40	-	-	-	-	1	C	03-01	02-28	100	12	-	12	12	12	12	12	12	12	7	12	C	7
3726	0450	8,601	34,331	42,932	569	6,552	1,480	-	-	-	-	83	C	03-01	02-28	100	1000	-	1,000	1,000	1,000	1,000	2,042	1,000	2,795	943	2,043	M	1,888
3727	0451	597	1,740	2,337	-	-	597	-	-	-	-	12	C	03-01	02-28	100	143	-	143	143	143	143	169	143	237	30	81	I	101
3729	0453	2,708	2,934	5,642	-	1,209	1,404	-	12	-	83 A	2	C	03-01	02-28	100	28	-	729	729	729	729	739	729	1,035	583	739	I	583
												6	C	06-15	09-05	067	11	5											
												129	C	05-16	10-31	067	478	228											
3730	0454	1,104	831	1,935	-	1,098	-	-	6	-	-	77	C	03-01	02-28	015	139	785	168	168	168	168	168	168	235	168	168	M	168
											-	80	S	03-01	02-28	015	29	163											
3731	0455	820	4,746	5,566	60	539	221	-	-	-	-	65	S	03-01	02-28	100	155	-	155	155	155	155	155	155	155	116	124	C	165
3732	0456	11,757	15,537	27,294	-	11,148	609	-	-	-	-	332	C	06-01	10-15	071	1062	432	1,940	1,940	1,940	1,940	2,997	1,940	4,196	1,921	2,997	I	2,946
3733	0457	416	900	1,316	-	220	196	-	-	-	-	40	S	03-01	02-28	100	96	-	96	96	96	96	96	96	96	88	96	C	92
3734	0458	120	2,459	2,579	-	120	-	-	-	-	-	2	C	03-01	02-28	100	24	-	24	24	24	24	24	24	24	24	24	C	28
3736	0460	18,880	28,532	47,412	3,590	13,583	1,576	-	131	-	-	3	C	03-01	02-28	100	32	-	2,755	2,755	2,755	2,755	4,238	2,755	5,553	2,667	4,238	M	4,074
												13	C	03-01	02-28	100	123												
												30	C	03-01	02-28	100	358												
												96	C	04-01	10-15	098	609	15											
												953	C	04-01	10-31	022	1499	5,172											
3737	0461	6,749	7,411	14,160	-	5,526	1,223	-	-	-	-	100	C	05-20	12-01	027	174	459	1,116	1,116	1,116	1,116	1,057	1,116	1,479	963	1,057	M	963
												125	C	03-01	02-28	027	405	1,095											
												700	C	03-01	02-28	027	454	1,226											
3739	0463	1,774	4,843	6,617	700	983	91	-	-	-	-	25	C	03-01	02-28	100	300	-	300	300	300	300	433	300	533	296	433	M	421
3740	0464	941	1,754	2,695	-	941	-	-	-	-	-	7	C	03-01	02-28	100	88	-	88	88	88	88	193	88	271	88	193	M	193
3741	0465	80	680	760	-	80	-	-	-	-	-	1	C	03-01	02-28	100	16	-	16	16	16	16	16	16	16	12	16	C	12
3742	0466	97	4,160	4,257	-	97	-	-	-	-	-	3	C	03-01	02-28	100	36	-	36	36	36	36	36	36	36	29	36	C	29
3743	0467	2,260	5,611	7,871	659	1,468	133	-	-	-	-	224	C	03-01	02-28	010	269	2,419	269	269	269	269	605	269	775	263	605	M	589
3744	0468	335	7,265	7,600	17	289	29	-	-	-	-	4	C	03-01	02-28	100	56	-	56	56	56	56	76	56	104	55	76	C	72
3745	0469	600	6,625	7,225	145	455	-	-	-	-	-	12	C	03-01	02-28	100	144	-	144	144	144	144	144	144	144	144	144	C	172
3746	0471	160	2,561	2,721	38	33	89	-	-	-	-	3	C	03-01	02-28	100	38	-	38	38	38	38	38	38	38	35	38	C	37
3748	0473	2,735	9,037	11,772	-	1,105	1,404	-	-	226W	-	40	S	03-01	02-28	100	99	-	520	520	520	520	748	520	1,016	442	748	I	593
												80	C	05-20	10-19	053	212	185											
												400	S	05-20	10-19	053	212	185											
3749	0474	315	3,168	3,483	-	287	28	-	-	-	-	26	S	03-01	02-28	100	65	-	65	65	65	65	65	65	65	65	65	C	67
3750	0476	640	3,640	4,280	-	640	-	-	-	-	-	13	C	03-01	02-28	100	158	-	158	158	158	158	158	158	158	158	158	C	178
3751	0477	440	2,389	2,829	3	370	67	-	-	-	-	8	C	03-01	02-28	100	104	-	104	104	104	104	110	104	153	100	110	M	103
	0681	812	2,040	2,852	7	681	124	-	-	-	-	20	C	03-01	02-28	100	236	-	236	236	236	236	245	236	341	227	245		230
3753	0479	40	559	599	-	40	-	-	-	-	-	1	C	03-01	02-28	100	13	-	13	13	13	13	13	13	13	11	13	C	11
3754	0480	754	7,067	7,821	-	252	463	-	-	-	39 D	9	C	03-01	02-28	100	113	-	113	113	113	113	113	113	113	94	113	C	137
3755	0481	1,213	2,559	3,772	-	879	334	-	-	-	-	12	C	03-01	02-28	100	272	-	272	272	272	272	309	272	433	260	309	M	276
3756	0482	40	1,267	1,307	-	40	-	-	-	-	-	1	C	03-01	02-28	100	13	-	13	13	13	13	13	13	13	11	13	C	11
3757	0483	878	3,780	4,658	-	803	75	-	-	-	-	90	S	03-01	02-28	100	211	-	211	211	211	211	211	211	211	172	211	C	172
3758	0484	400	1,805	2,205	-	200	200	-	-	-	-	10	C	03-01	02-28	100	129	-	129	129	129	129	129	129	129	90	129	C	90
3759	0485	6,929	3,465	10,394	-	6,294	577	-	19	39W	-	7	C	03-01	02-28	100	87	-	864	864	864	864	1,279	864	1,785	842	1,279	I	1,214
												157	C	05-01	11-15	076	777	244											

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use	%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																			ST	LT	ST	LT	ST	LT	ST	LT		
3760	0486	7,656	7,073	14,729	-	7,254	302	-	-	100W	-	10	H	03-01 02-28	025	30	90	831	831	831	831	1,422	831	1,978	822	1,422	M	1,399
												69	C	03-01 02-28	025	208	620											
												988	S	03-01 02-28	025	593	1,783											
3761	0487	1,030	2,360	3,390	-	495	535	-	-	-	-	26	C	03-01 02-28	100	310	-	310	310	310	310	277	310	388	219	277	I	219
3762	0488	1,209	5,027	6,236	236	932	6	-	-	-	35 A	21	C	03-01 02-28	100	253	-	253	253	253	253	253	253	253	253	253	C	281
3763	0489	160	4,859	5,019	-	151	-	9	-	-	-	2	C	03-01 02-28	100	22	-	22	22	22	22	22	22	22	22	22	C	34
3764	0490	437	4,240	4,677	-	198	239	-	-	-	-	12	C	03-01 02-28	100	148	-	148	148	148	148	148	148	148	89	148	C	89
3765	0491	80	4,387	4,467	-	80	-	-	-	-	-	2	C	03-01 02-28	100	24	-	24	24	24	24	24	24	24	24	24	C	23
3768	0494	7,872	10,799	18,671	1276	5,876	720	-	-	-	-	8	C	03-01 02-28	100	104	-	1,440	1,440	1,440	1,440	2,040	1,440	2,733	1,374	2,014	I	1,956
												84	C	04-15 12-09	070	463	192											
												232	C	04-15 12-09	048	873	937											
3769	0625	40	404	480	-	40	-	-	-	-	-	1	C	03-01 02-28	100	13	-	13	13	13	13	13	13	13	13	13	C	12
	0626	120	200	320	-	120	-	-	-	-	-	3	C	03-01 02-28	100	40	-	40	40	40	40	40	40	40	34	40		34
3770	0495	80	1,007	1,087	-	80	-	-	-	-	-	2	C	03-01 02-28	100	27	-	27	27	27	27	27	27	27	21	27	C	21
3771	0496	852	5,392	6,244	12	683	144	-	13	-	-	20	C	03-01 02-28	100	243	-	243	243	243	243	243	243	243	236	243	C	237
3772	0497	706	6,611	7,317	-	645	61	-	-	-	-	15	C	03-01 02-28	100	188	-	188	188	188	188	188	188	188	135	188	C	135
3773	0498	1,145	19,182	20,327	-	397	611	90	47	-	-	12	C	03-01 02-28	100	143	-	143	143	143	143	143	143	143	121	143	C	190
3774	0499	438	1,811	2,249	-	371	-	-	-	-	-	1	C	03-01 02-28	100	10	-	89	89	89	89	89	89	89	89	89	C	115
												40	C	08-16 10-15	100	79	-										M	
3775	0500	2,741	3,987	6,728	-	2,577	67	17	80	-	-	23	S	03-01 02-28	100	54	-	450	450	450	450	584	450	817	448	584	M	574
											-	100	C	03-01 02-28	014	168	1,032											
											-	678	S	03-01 02-28	014	228	1,404											
3776	0501	455	2,412	2,867	-	455	-	-	-	-	-	4	C	03-01 02-28	100	46	-	46	46	46	46	46	46	46	46	46	C	111
3777	0503	120	1,754	1,874	-	120	-	-	-	-	-	3	C	03-01 02-28	100	40	-	40	40	40	40	40	40	40	36	40	C	36
3778	0504	4,159	5,100	9,259	-	983	3,170	-	6	-	-	280	C	03-01 02-28	024	808	2,552	808	808	808	808	1,034	808	1,448	691	1,034	I	717
3779	0505	1,133	18,133	19,266	-	1,133	-	-	-	-	-	16	C	03-01 02-28	100	196	-	196	196	196	196	196	196	196	196	196	C	317
3780	0506	920	2,520	3,440	-	920	-	-	-	-	-	19	C	03-01 02-28	100	226	-	226	226	226	226	258	226	362	226	258	M	258
3781	0507	1,640	6,620	8,260	-	1,254	369	-	17	-	-	35	C	03-01 02-28	100	418	-	418	418	418	418	341	418	477	307	341	M	307
3782	0716	6,575	13,733	20,308	276	5,969	330	-	-	-	-	97	C	03-01 02-28	100	1165	-	1,165	1,165	1,165	1,165	1,602	1,165	2,210	1,152	1,602	M	1,567
3783	0508	4,843	27,099	31,942	498	2,640	1,695	-	10	-	-	94	C	03-01 02-28	100	1107	-	1,107	1,107	1,107	1,107	1,257	1,107	1,688	1,042	1,257	M	1,079
3784	0509	5,416	16,635	22,051	-	2,804	2,544	56	12	-	-	2	C	03-01 02-28	100	24	-	808	808	808	808	1,261	808	1,766	640	1,261	M	1,000
												15	C	03-01 02-28	100	184	-											
												47	C	06-01 06-31	100	47	-											
												200	C	04-01 04-30	025	50	150											
														09-17 10-16	025	50	150											
												400	C	05-01 09-16	025	453	1,359											
3785	0510	872	6,583	7,455	-	872	-	-	-	-	-	11	C	03-01 02-28	100	139	-	139	139	139	139	139	139	139	139	139	C	222
3786	0511	105	1,363	1,468	-	46	49	-	-	-	10 A	2	C	03-01 02-28	100	28	-	28	28	28	28	28	28	28	16	28	C	16
3787	0512	684	3,162	3,846	-	-	684	-	-	-	-	9	C	03-01 02-28	100	111	-	111	111	111	111	111	111	111	84	111	C	106
3788	0513	180	4,102	4,282	-	54	126	-	-	-	-	5	C	03-01 02-28	100	60	-	60	60	60	60	60	60	60	35	60	C	35
3790	0514	2,570	2,536	5,106	-	1,781	789	-	-	-	-	359	Y	04-20 10-19	024	517	1,623	388	388	388	388	403	388	564	343	403	M	343
3791	0515	11,201	10,900	22,101	-	10,447	644	-	24	66W	-	70	C	05-01 06-14	062	64	41	1,793	1,793	1,793	1,793	2,172	1,793	3,018	1,776	2,172	M	2,108
												94	C	06-15 10-14	069	260	113											
												158	C	03-01 02-28	022	421	1,475											
												1000	S	03-01 06-14	022	153	547											
														06-15 09-14	069	414	186											
														09-15 12-14	062	372	328											
														12-15 02-28	022	109	391											
3792	0516	548	3,235	3,783	-	80	468	-	-	-	-	13	C	03-01 02-28	100	154	-	154	154	154	154	154	154	154	100	154	C	100
3793	0517	240	2,270	2,510	-	76	113	51	-	-	-	4	C	03-01 02-28	100	53	-	53	53	53	53	53	53	53	35	53	C	35
3794	0156	1,600	2,394	3,994	-	1,600	-	-	-	-	-	37	C	03-01 02-28	100	449	-	449	449	449	449	449	449	629	449	449	M	449

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use		%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																				ST	LT	ST	LT	ST	LT	ST	LT		
3795	0518	40	800	840	-	40	-	-	-	-	-	1	C	03-01	02-28	100	10	-	10	10	10	10	10	10	10	8	10	C	8
3796	0519	560	1,280	1,840	-	304	256	-	-	-	-	11	C	03-01	02-28	100	131	-	131	131	131	131	131	131	131	120	131	C	127
3797	0520	2,904	10,266	13,170	-	1,826	957	64	-	55 B	2 A	75	Y	03-01	02-28	100	682	-	682	682	682	682	810	682	1,123	641	810	M	687
3798	0521	279	6,747	7,026	-	162	117	-	-	-	-	6	C	03-01	02-28	100	72	-	72	72	72	72	72	72	72	63	72	C	63
3799	0522	4,216	12,865	17,081	32	3,322	862	-	-	-	-	78	C	03-01	02-28	100	942	-	942	942	942	942	1,001	942	1,398	905	1,001	M	905
3800	0523	400	13,777	14,177	-	64	336	-	-	-	-	8	C	03-01	02-28	100	100	-	100	100	100	100	100	100	100	72	100	C	72
3801	0524	6,897	11,024	17,921	939	4,139	1,819	-	-	-	-	67	C	03-01	02-28	100	808	-	808	808	808	808	1,720	808	2,315	736	1,720	M	1,524
3802	0525	1,941	4,540	6,481	-	1,049	892	-	-	-	-	37	C	03-01	02-28	100	448	-	448	448	448	448	539	448	754	412	539	I	442
3803	0526	5,506	4,408	9,914	177	5,072	257	-	-	-	-	6	C	03-01	02-28	100	79	-	1,016	1,016	1,016	1,016	1,168	1,016	1,618	995	1,168	I	1,142
												300	C	04-01	10-15	048	937	1,013											
	0694	1,601	5,504	7,105	52	1,474	75	-	-	-	-	1	C	03-01	02-28	100	11	-	428	428	428	428	500	428	693	419	500		490
												305	C	04-01	10-15	021	417	1,566											
3804	0527	80	3,729	3,809	-	40	40	-	-	-	-	2	C	03-01	02-28	100	21	-	21	21	21	21	21	21	21	18	21	C	18
3805	0528	198	2,115	2,313	48	150	-	-	-	-	-	3	C	03-01	02-28	100	32	-	32	32	32	32	32	32	32	32	32	C	47
3806	0529	1,538	26,232	27,770	97	1,351	90	-	-	-	-	22	C	03-01	02-28	100	260	-	260	260	260	260	260	260	260	256	260	C	421
3807	0530	1,024	3,600	4,624	-	895	129	-	-	-	-	17	C	03-01	02-28	100	206	-	206	206	206	206	266	206	372	201	266	M	252
3808	0531	160	2,720	2,880	-	160	-	-	-	-	-	2	C	03-01	02-28	100	25	-	25	25	25	25	25	25	25	25	25	C	46
3809	0492	2,070	3,720	5,790	-	1,434	632	4	-	-	-	38	C	03-01	02-28	100	454	-	454	454	454	454	585	454	819	419	585	M	511
	0532	202	4,735	4,937	-	139	62	1	-	-	-	3	C	03-01	02-28	100	42	-	42	42	42	42	54	42	76	39	54		47
3810	0533	1,398	1,438	2,836	-	1,398	-	-	-	-	-	179	C	06-01	11-10	023	219	735	219	219	219	219	408	219	571	219	408	M	408
3811	0534	1,246	2,772	4,018	-	1,206	40	-	-	-	-	23	C	03-01	02-28	100	277	-	277	277	277	277	366	277	512	275	366	M	361
3812	0535	1,195	3,319	4,514	-	1,147	48	-	-	-	-	25	C	03-01	02-28	100	305	-	305	305	305	305	323	305	452	303	323	M	318
3813	0536	3,292	27,465	30,757	618	1,800	852	-	22	-	-	58	C	03-01	02-28	100	699	-	699	699	699	699	816	699	1,061	666	816	M	728
3814	0537	7,516	38,001	45,517	292	3,119	3,932	-	173	-	-	122	C	03-01	02-28	100	1466	-	1,466	1,466	1,466	1,466	1,546	1,466	2,143	1,201	1,546	I	1,201
3815	0538	2,240	45,562	47,802	-	1,369	871	-	-	-	-	43	C	03-01	02-28	100	512	-	512	512	512	512	606	512	849	477	606	M	511
3817	0540	560	640	1,200	-	-	560	-	-	-	-	8	C	03-01	02-28	100	92	-	92	92	92	92	152	92	212	69	152	I	91
3818	0541	40	160	200	-	40	-	-	-	-	-	1	C	03-01	02-28	100	12	-	12	12	12	12	12	12	12	12	12	C	12
3819	0542	160	3,753	3,913	-	160	-	-	-	-	-	3	C	03-01	02-28	100	40	-	40	40	40	40	40	40	40	40	40	C	68
3820	0543	5,469	14,547	20,016	-	3,338	2,119	-	12	-	-	61	C	03-01	02-28	100	727	-	727	727	727	727	1,326	727	1,857	646	1,326	M	1,101
3821	0544	801	10,238	11,039	-	801	-	-	-	-	-	15	C	03-01	02-28	100	180	-	180	180	180	180	180	180	180	180	180	C	207
3822	0545	2,305	8,470	10,775	-	1,948	345	-	12	-	-	26	C	03-01	02-28	100	312	-	486	486	486	486	596	486	833	466	596	M	554
												200	C	06-16	07-30	058	174	126											
3823	0546	960	1,760	2,720	12	469	475	4	-	-	-	85	S	03-01	02-28	100	205	-	205	205	205	205	215	205	300	167	215	I	167
3824	0547	40	640	680	-	-	40	-	-	-	-	1	C	03-01	02-28	100	15	-	15	15	15	15	15	15	15	8	15	C	8
3825	0548	80	2,890	2,970	-	80	-	-	-	-	-	1	C	03-01	02-28	100	13	-	13	13	13	13	13	13	13	13	13	C	22
3826	0549	399	647	1,046	-	239	160	-	-	-	-	37	S	03-01	02-28	100	89	-	89	89	89	89	89	89	89	67	89	C	67
3827	0550	1,720	3,001	4,721	-	1,560	160	-	-	-	-	45	C	06-01	10-31	036	81	144	441	441	441	441	420	441	588	403	420	M	403
												1000	S	06-01	10-31	036	360	640											
3828	0551	360	1,320	1,680	-	239	-	-	121	-	-	35	S	03-01	02-28	100	83	-	83	83	83	83	83	83	83	64	83	C	64
3829	0552	364	1,720	2,084	-	358	-	-	6	-	-	7	C	03-01	02-28	100	84	-	84	84	84	84	84	84	84	84	84	C	100
3830	0553	320	1,040	1,360	-	320	-	-	-	-	-	5	C	03-01	02-28	100	59	-	59	59	59	59	59	59	59	59	59	C	82
3831	0554	1,120	1,610	2,730	168	952	-	-	-	-	-	12	C	03-01	02-28	100	149	-	149	149	149	149	235	149	318	149	235	M	235
3832	0555	864	6,004	6,868	290	574	-	-	-	-	-	19	C	03-01	02-28	100	220	-	220	220	220	220	220	220	220	220	220	C	223
3834	0688	1,994	2,487	4,481	-	1,631	363	-	-	-	-	108	S	03-01	02-28	100	259	-	259	259	259	259	257	259	360	238	257	M	238
3835	0557	2,490	13,269	15,759	-	1,839	651	-	-	-	-	42	C	03-01	02-28	100	504	-	504	504	504	504	578	504	810	487	578	M	531
3836	0695	2,307	3,124	5,431	-	1,162	1,145	-	-	-	-	150	C	03-01	02-28	020	355	1,445	478	478	478	478	434	478	608	333	434	I	333
										-	-	260	S	03-01	02-28	020	123	501											
3837	0558	790	4,880	5,670	-	7	776	-	7	-	-	13	C	03-01	02-28	100	152	-	152	152	152	152	152	152	152	64	152	C	64
3838	0559	660	760	1,420	-	660	-	-	-	-	-	13	C	03-01	02-28	100	150	-	150	150	150	150	120	150	168	120	150	M	120
3839	0560	3,324	10,683	14,007	-	2,504	673	-	-	147W	-	1	C	03-01	02-28	100	12	-	523	523	523	523	733	523	1,005	491	733	I	685
										-	-	102	C	05-16	10-15	100	511	-											

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use	%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A ST	Alt A LT	Alt B ST	Alt B LT	Alt C ST	Alt C LT	Alt D ST	Alt D LT	M C I	Current Prod. AUMs
3840	0561	6,095	10,837	16,932	-	4,964	1,131	-	-	-	-	200	S	03-01 02-28	022	106	377	1,224	1,224	1,224	1,224	1,143	1,224	1,601	1,037	1,129	M	1,037
												400	C	03-01 02-28	022	1056	3,744											
3841	0562	3,372	8,727	12,099	-	2,333	790	-	34	215W	-	3	C	03-01 02-28	100	40	-	605	605	605	605	806	605	1,091	563	806	I	748
												213	C	05-15 10-15	053	565	500											
3842	0563	160	354	514	-	-	160	-	-	-	-	4	C	03-01 02-28	100	51	-	51	51	51	51	51	51	51	16	51	C	16
3843	0564	517	3,025	3,542	-	439	78	-	-	-	-	10	C	03-01 02-28	100	124	-	124	124	124	124	124	124	124	121	124	C	129
3844	0565	2,543	5,118	7,661	-	697	1,846	-	-	-	-	43	C	03-01 02-28	100	521	-	521	521	521	521	561	521	785	406	561	I	406
3845	0566	4,457	6,622	11,079	-	1,240	2,776	28	-	413W	-	12	C	03-01 02-28	100	119	-	1,013	1,013	1,013	1,013	1,174	1,013	1,585	793	1,174	I	878
					-							20	C	05-01 09-30	057	57	43											
												125	C	05-01 10-31	037	278	472											
												900	S	05-01 09-30	057	513	387											
3846	0567	2,047	6,078	8,125	-	1,118	926	-	3	-	-	150	C	06-15 10-14	071	427	173	427	427	427	427	396	427	555	328	396	I	328
3847	0568	240	2,080	2,320	-	-	240	-	-	-	-	4	C	03-01 02-28	100	47	-	47	47	47	47	47	47	47	34	47	C	34
3848	0392	5,224	8,362	13,586	-	2,672	2,430	-	6	116W	-	2	C	03-01 02-28	100	24	-	1,122	1,122	1,122	1,122	1,253	1,122	1,743	950	1,223	I	992
											-	425	C	05-15 10-31	047	1098	1,240											
	0452	1,437	1,938	3,375	-	735	668	-	2	32W	-	3	C	03-01 02-28	100	39	-	222	222	222	222	246	222	342	195	246		195
											-	98	C	06-16 09-15	062	183	111											
	0569	3,476	12,564	16,040	-	1,778	1,618	-	3	77W	-	54	C	03-01 02-28	100	649	-	649	649	649	649	739	649	1,027	545	710		584
3849	0697	115	2,209	2,324	-	40	75	-	-	-	-	3	C	03-01 02-28	100	38	-	38	38	38	38	38	38	38	18	38	C	18
3850	0571	2,414	2,440	4,854	-	2,414	-	-	-	-	-	52	C	03-01 02-28	100	625	-	625	625	625	625	565	625	791	565	625	M	565
3851	0572	160	1,880	2,040	-	160	-	-	-	-	-	5	S	03-01 02-28	100	16	-	16	16	16	16	16	16	16	16	16	C	40
3852	0575	6,859	33,980	40,839	-	1,946	4,903	6	4	-	-	635	C	03-01 02-28	013	991	6,629	991	991	991	991	1,683	991	2,356	805	1,683	I	1,187
3853	0576	10,468	28,991	39,459	-	4,624	5,779	65	-	-	-	28	H	03-01 02-28	011	37	299	1,568	1,568	1,568	1,568	2,569	1,568	3,723	1,374	2,659	I	2,047
												1025	C	04-01 11-30	011	902	7,298											
												1425	C	03-01 03-31	011	157	1,268											
														12-01 02-28	011	470	3,805											
3854	0577	1,145	9,562	10,707	-	1,019	126	-	-	-	-	16	C	03-01 02-28	100	192	-	192	192	192	192	281	192	395	186	281	M	265
3855	0578	4,050	6,797	10,847	-	3,855	185	-	10	-	-	5	C	03-01 02-28	100	58	-	706	706	706	706	851	706	1,191	692	851	M	704
												180	C	04-01 06-22	057	281	211											
														06-23 11-08	045	367	441											
3856	0579	270	1,643	1,913	-	106	164	-	-	-	-	5	C	03-01 02-28	100	57	-	57	57	57	57	57	57	57	49	57	C	49
3857	0580	989	1,362	2,351	-	207	782	-	-	-	-	18	C	03-01 02-28	100	222	-	222	222	222	222	269	222	376	184	269	I	184
3858	0581	480	3,300	3,780	161	319	-	-	-	-	-	9	C	03-01 02-28	100	107	-	107	107	107	107	107	107	107	107	107	C	136
3859	0582	1,268	3,086	4,354	-	1,268	-	-	-	-	-	28	C	03-01 02-28	100	336	-	336	336	336	336	297	336	416	297	336	M	297
3860	0583	1,337	3,714	5,051	24	1,171	142	-	-	-	-	8	C	03-01 02-28	100	251	-	251	251	251	251	331	251	461	246	331	M	315
3861	0584	40	1,430	1,470	-	40	-	-	-	-	-	1	C	03-01 02-28	100	11	-	11	11	11	11	11	11	11	9	11	C	9
3862	0585	282	4,786	5,068	-	124	158	-	-	-	-	25	S	03-01 02-28	100	66	-	66	66	66	66	66	66	66	33	40	C	59
3863	0586	2,240	2,243	4,483	158	2,010	56	-	-	-	-	154	C	05-01 10-31	043	398	526	398	398	398	398	596	398	814	395	596	M	585
3864	0587	40	40	80	-	40	-	-	-	-	-	1	C	03-01 02-28	100	16	-	16	16	16	16	16	16	16	10	16	C	10
3865	0588	4,773	20,486	25,259	190	2,869	1,682	-	32	-	-	24	C	03-01 02-28	100	286	-	959	959	959	959	1,067	959	1,478	870	1,039	M	906
												56	C	03-01 02-28	100	673	-											
3866	0589	40	120	160	-	40	-	-	-	-	-	3	S	03-01 02-28	100	8	-	8	8	8	8	8	8	8	8	8	C	7
3867	0590	1,657	1,640	3,297	-	1,657	-	-	-	-	-	121	C	05-15 10-31	045	299	367	299	299	299	299	251	299	351	251	299	I	251
3868	0591	340	1,677	2,017	-	340	-	-	-	-	-	9	C	03-01 02-28	100	113	-	113	113	113	113	113	113	113	77	113	C	77
3869	0592	5,490	3,941	9,431	19	5,419	52	-	-	-	-	18	C	03-01 02-28	100	217	-	980	980	980	980	1,090	980	1,525	980	1,090	M	1,087
												165	C	07-01 10-31	072	477	183											
												208	C	07-01 09-31	046	286	338											
3871	0594	32	1,404	1,436	-	32	-	-	-	-	-	1	C	03-01 02-28	100	9	-	9	9	9	9	9	9	9	9	9	C	10
3872	0595	40	1,240	1,280	21	-	19	-	-	-	-	1	C	03-01 02-28	100	10	-	10	10	10	10	10	10	10	8	10	C	8

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use	%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																			ST	LT	ST	LT	ST	LT	ST	LT		
3873	0596	906	6,997	7,903	-	436	470	-	-	-	-	18	C	03-01 02-28	100	221	-	221	221	221	221	221	221	221	201	221	C	207
3874	0597	4,243	9,566	13,809	-	3,455	788	-	-	-	-	82	C	03-01 02-28	100	973	-	973	973	973	973	1,173	973	1,643	941	1,173	M	1,088
3875	0598	610	280	890	-	561	49	-	-	-	-	11	C	03-01 02-28	100	131	-	131	131	131	131	131	131	131	129	131	C	169
3876	0418	140	720	860	-	107	27	-	6	-	-	8	C	03-01 02-28	100	93	-	93	93	93	93	93	93	93	36	93	C	36
3877	0599	285	1,585	1,870	-	44	241	-	-	-	-	7	C	03-01 02-28	100	83	-	83	83	83	83	83	83	83	55	83	C	55
3878	0600	203	3,176	3,379	-	174	29	-	-	-	-	3	C	03-01 02-28	100	40	-	40	40	40	40	40	40	40	39	40	C	52
3879	0601	13,626	10,436	24,062	1,702	10,707	1,150	23	2	-	42 A	8	C	03-01 02-28	100	97	-	2,939	2,939	2,939	2,939	3,307	2,939	4,455	2,827	3,287	I	3,161
												994	C	05-01 10-15	054	2842	2,625											
3880	0602	4,554	13,558	18,112	-	3,712	842	-	-	-	-	335	S	03-01 02-28	100	811	-	811	811	811	811	678	811	950	610	678	M	610
3881	0603	83	1,996	2,079	-	83	-	-	-	-	-	1	C	03-01 02-28	100	18	-	18	18	18	18	18	18	18	18	18	C	22
3882	0604	1,028	10,641	11,669	-	413	615	-	-	-	-	15	C	03-01 02-28	100	150	-	150	150	150	150	150	150	150	116	140	C	203
3883	0635	2,455	3,365	5,820	-	1,878	577	-	-	-	-	36	C	03-01 02-28	100	438	-	438	438	438	438	653	438	915	413	653	M	585
3884	0605	80	840	920	-	54	26	-	-	-	-	2	C	03-01 02-28	100	27	-	27	27	27	27	27	27	27	25	27	C	28
	0606	160	1,920	2,080	-	106	54	-	-	-	-	3	C	03-01 02-28	100	32	-	32	32	32	32	32	32	32	29	32		33
3885	0607	10,917	11,407	22,324	-	10,234	674	-	9	-	-	2080	S	03-01 02-28	032	1,597	3,395	1,607	1,607	1,607	1,607	1,556	1,607	2,178	1,503	1,556	M	1,503
3886	0608	1,019	1,257	2,276	-	639	380	-	-	-	-	6	C	03-01 02-28	100	77	-	146	146	146	146	225	146	310	138	225	I	185
		639			75	563	-	-	1	-	-					69	-											
3887	0609	1,075	3,304	4,379	-	1,037	22	-	16	-	-	17	C	03-01 02-28	100	208	-	208	208	208	208	314	208	439	207	314	M	311
3888	0610	1,648	3,151	4,799	-	534	1,113	-	1	-	-	30	C	03-01 02-28	100	369	-	369	369	369	369	394	369	552	287	394	I	287
3889	0611	1,662	30,046	31,708	-	773	867	12	10	-	-	37	C	03-01 02-28	100	450	-	450	450	450	450	450	450	450	344	450	C	344
3890	0612	3,050	11,429	14,479	-	704	2,343	-	3	-	-	27	C	03-01 02-28	100	318	-	318	318	318	318	565	318	791	249	565	I	376
3891	0614	200	560	760	-	113	31	56	-	-	-	4	C	03-01 02-28	100	53	-	53	53	53	53	53	53	53	42	53	C	42
3892	0616	1,291	11,116	12,407	17	411	863	-	-	-	-	22	C	03-01 02-28	100	264	-	264	264	264	264	347	264	483	132	253	I	251
3893	0297	108	5,049	5,157	-	108	-	-	-	-	-	2	C	03-01 02-28	100	24	-	24	24	24	24	24	24	24	24	24	C	29
3894	0617	659	3,255	3,914	-	647	12	-	-	-	-	2	C	03-01 02-28	100	24	-	163	163	163	163	117	163	163	117	163	I	117
								-	-	-	-	116	S	05-01 11-01	100	139	-											
3895	0618	154	2,634	2,788	-	26	128	-	-	-	-	3	C	03-01 02-28	100	39	-	39	39	39	39	39	39	39	24	39	C	24
3896	0651	648	1,034	1,682	-	466	182	-	-	-	-	60	C	05-15 10-14	078	230	70	230	230	230	230	176	230	246	160	176	M	160
3897	0652	1,291	730	2,021	-	109	983	-	-	199W	-	2	C	03-01 02-28	100	24	-	317	317	317	317	236	317	309	167	236	I	167
												10	C	05-15 06-20	080	10	2											
												40	C	07-15 10-01	080	82	20											
												98	C	07-15 10-01	080	201	47											
3898	0653	6,067	4,800	10,867	-	2,132	3,902	-	-	33W	-	42	C	03-01 02-28	100	507	-	1,513	1,513	1,513	1,513	1,106	1,513	1,544	817	1,082	I	817
												216	C	10-15 12-14	091	394	38											
												224	C	04-15 07-14	091	612	60											
3899	0654	1,184	4,680	5,864	-	882	302	-	-	-	-	5	C	03-01 02-28	100	60	-	275	275	275	275	183	275	255	155	183	M	155
												55	C	05-15 10-14	069	190	85											
3900	0655	480	1,567	2,047	-	58	422	-	-	-	-	7	C	03-01 02-28	100	80	-	80	80	80	80	84	80	117	54	84	I	54
3901	0657	328	840	1,168	54	274	-	-	-	-	-	4	C	03-01 02-28	100	50	-	50	50	50	50	50	50	50	50	50	C	109
3903	0659	1,698	3,148	4,846	-	679	483	-	4	532C	-	2	C	03-01 02-28	100	25	-	406	406	406	406	336	406	433	302	336	I	302
												20	C	05-15 10-14	036	36	64											
												69	C	05-15 10-15	100	345	-											
3904	0661	202	1,862	2,064	40	145	17	-	-	-	-	5	C	03-01 02-28	100	54	-	54	54	54	54	54	54	54	53	54	C	75
3905	0660	1,187	880	2,067	-	625	245	-	-	317C	-	99	C	06-20 10-15	100	385	-	422	422	422	422	254	422	329	233	254	I	233
3906	0662	2,573	2,949	5,522	-	40	1,340	-	286	907C	-	3	C	03-01 02-28	100	40	-	497	497	497	497	345	497	433	259	345	I	259
												100	C	05-15 10-01	100	457	-											
3907	0665	40	5,360	5,400	-	40	-	-	-	-	-	1	C	03-01 02-28	100	10	-	10	10	10	10	10	10	10	10	10	C	11
3908	0663	2,576	11,874	14,450	-	1,581	814	-	17	164W	-	109	C	06-01 09-01	100	332	-	500	500	500	500	394	500	532	343	394	M	343
												125	C	06-15 07-31	086	168	20											
3909	0664	1,360	1,760	3,120	-	989	371	-	-	-	-	44	C	05-15 09-14	092	162	14	165	165	165	165	150	165	209	124	150	M	124

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use	%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																			ST	LT	ST	LT	ST	LT	ST	LT		
3910	0666	2,652	2,760	5,412	-	1,746	305	-	228	373C	-	4	C	03-01 02-28	100	45	-	621	621	621	621	413	621	555	381	413	I	381
												65	Y	07-15 10-14	077	150	45											
3911	0668	1,984	4,501	7,385	-	547	587	149	701	-	-	100	C	04-25 10-24	033	197	430	395	395	395	395	190	395	267	131	190	I	131
												500	S	04-25 10-24	033	198	402											
3912	0669	5,924	6,054	11,978	-	2,971	2,282	-	-	181C	-	2	C	03-01 02-28	100	25	-	992	992	992	992	1,238	992	1,651	920	1,238	I	1,064
										490W		100	C	05-15 10-03	016	74	386											
												355	C	06-01 11-20	043	865	1,148											
3913	0670	1,139	515	1,654	-	286	276	-	-	577C	-	89	Y	05-15 10-14	100	335	-	335	335	335	335	192	335	231	174	192	I	174
3914	0671	1,105	640	1,745	-	511	594	-	-	-	-	174	C	06-01 08-31	051	270	252	270	270	270	270	156	270	219	115	156	I	115
3915	0674	1,735	1,991	3,726	-	447	1,184	42	49	13W	-	150	Y	05-15 08-15	078	355	95	365	365	365	365	213	365	297	144	213	I	144
3916	0675	4,385	2,600	6,985	-	3,234	940	-	40	171W	-	1	C	03-01 02-28	100	8	-	700	700	700	700	841	700	1,163	651	837	M	774
												103	C	05-15 10-14	084	433	82											
												310	S	05-15 10-14	084	259	51											
3917	0676	720	1,160	1,880	-	711	9	-	-	-	-	25	C	05-15 09-15	100	101	-	248	248	248	248	210	248	294	209	210	M	209
												36	C	05-15 09-15	100	147	-											
3918	0677	1,290	1,360	2,650	249	428	196	-	23	394C	-	59	C	05-15 09-03	100	212	212	212	212	212	212	186	212	222	171	186	M	171
3919	0656	4,298	2,557	6,855	-	1,809	2,108	-	83	298C	-	138	C	05-15 10-15	100	695	-	695	695	695	695	619	695	836	462	619	I	462
	0679	1,560	3,740	5,300	28	580	299	T	209	129C	16R	61	C	05-16 10-15	087	265	40	265	265	265	265	226	265	269	185	226	I	204
										299W																		
3920	0678	2,862	2,800	5,662	-	1,480	1,054	-	-	262C	-	160	C	05-16 09-15	089	572	68	572	572	572	572	493	572	664	407	493	I	407
										66W	-																	
3921	0673	1,560	640	2,200	28	580	299	T	209	129C	16R	82	C	06-15 10-14	088	287	41	287	287	287	287	226	287	269	204	287	I	204
										299W																		
3922	0384	2,606	6,305	8,911	-	1,610	996	-	-	-	-	1	C	03-01 02-28	100	16	-	502	502	502	502	470	502	658	377	470	I	377
												83	Y	05-01 10-30	054	162	336											
												1000	S	06-01 10-30	054	324	676											
3923	0615	6,664	7,837	14,501	-	4,546	1,375	-	1	742W	-	35	C	03-01 02-28	100	422	-	767	767	767	767	1,708	767	2,186	745	1,708	I	1,548
												92	C	05-15 10-15	075	345	115											
3924	0275	837	11,160	11,997	-	654	182	-	1	-	-	16	C	03-01 02-28	100	193	-	193	193	193	193	193	193	193	186	193	C	212
3925	0213	17,047	28,642	45,689	-	8,764	7,087	105	141	875C	75A	63	C	03-01 02-28	100	760	-	4,263	4,263	4,263	4,263	3,992	4,263	5,492	3,291	3,992	I	3,291
												471	C	06-15 10-15	065	1225	659											
												703	C	05-01 10-31	054	2278	1,940											
3926	0446	12,151	22,184	34,335	-	6,324	5,208	239	380	-	-	21	H	03-01 02-28	020	50	202	2,893	2,893	2,893	2,893	2,944	2,893	4,122	2,336	2,944	I	2,336
												1185	C	03-01 02-28	020	2843	11,377											
3927	0502	5,171	1,608	6,779	-	965	3,016	743	447	-	-	104	S	03-01 02-28	100	249	-	933	933	933	933	877	933	1,227	537	877	I	537
												137	C	05-15 10-14	100	684	-											
3928	0672	2,023	640	2,663	37	752	387	T	272	167C	22R	81	C	05-15 10-14	087	352	53	352	352	352	352	292	352	349	264	352	I	264
										386W																		
3929	0667	636	2,480	3,116	12	236	121	T	85	53C	7R	26	C	05-16 10-15	087	113	17	113	113	113	113	92	113	110	83	113	I	83
										122W																		
3930	0628	1,080	11,520	12,600	-	511	569	-	-	-	-	22	C	04-16 10-31	100	146	-	146	146	146	146	146	146	146	118	146	C	198
3931	0629	235	2,441	2,676	28	207	-	-	-	-	-	3	C	03-01 02-28	100	45	-	45	45	45	45	45	45	45	45	45	C	58
3932	0613	2,343	12,083	14,426	-	2,163	180	-	-	-	-	36	C	03-01 02-28	100	433	-	433	433	433	433	515	433	721	428	515	M	502
3933	0680	996	3,200	4,196	-	989	-	-	7	-	-	13	C	03-01 02-28	100	159	-	159	159	159	159	225	159	314	159	225	M	225
3934	0690	2,713	5,852	8,565	-	1,331	1,256	6	-	320W	-	17	C	03-01 02-28	100	205	-	683	683	683	683	621	683	837	516	621	I	516
												125	Y	05-05 10-14	073	478	147											
3935	0691	329	1,577	1,906	-	-	329	-	-	-	-	5	C	03-01 02-28	100	56	-	56	56	56	56	56	56	56	41	56	C	41
3936	0692	3,866	16,207	20,073	12	2,190	1,617	47	-	-	-	44	C	03-01 02-28	100	532	-	532	532	532	532	970	532	1,356	471	970	M	798
3937	0630	7,160	14,568	21,728	278	4,214	2,510	-	8	248	-	735	C	03-01 02-28	023	2003	6,817	2,003	2,003	2,003	2,003	1,870	2,003	1,397	1,600	1,870	M	1,600
										126W																		

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use		%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																				ST	LT	ST	LT	ST	LT	ST	LT		
3938	0631	315	2,366	2,681	-	315	-	-	-	-	-	9	C	03-01	02-28	100	116	-	116	116	116	116	116	116	116	92	116	C	92
3939	0695	6,628	5,052	11,680	-	5,980	595	-	53	-	-	31	C	03-01	02-28	100	131	-	1,339	1,339	1,339	1,339	1,290	1,339	1,806	1,232	1,290	M	1,232
												1090	S	06-01	11-01	088	958	132											
3940	0632	28	1,000	1,028	-	-	28	-	-	-	-	1	C	03-01	02-28	100	7	-	7	7	7	7	7	7	7	7	7	C	7
3941	0633	25	4,511	4,536	-	25	-	-	-	-	-	1	C	03-01	02-28	100	6	-	6	6	6	6	6	6	6	6	6	C	7
3942	0698	40	1,560	1,600	-	-	40	-	-	-	-	1	C	03-01	02-28	100	10	-	10	10	10	10	10	10	10	6	10	C	6
3943	0699	87	2,342	2,429	-	87	-	-	-	-	-	2	C	03-01	02-28	100	19	-	19	19	19	19	19	19	19	17	19	C	17
3944	0700	320	2,560	2,880	-	219	101	-	-	-	-	5	C	03-01	02-28	100	64	-	64	64	64	64	64	64	64	59	64	C	66
	0732	40	493	533	-	27	13	-	-	-	-	1	C	03-01	02-28	100	14	-	14	14	14	14	14	14	14	13	14		14
3945	0701	183	1,431	1,614	-	183	-	-	-	-	-	5	C	03-01	02-28	100	57	-	57	57	57	57	57	57	57	46	57	C	46
3946	0702	40	1,920	1,960	-	40	-	-	-	-	-	1	C	03-01	02-28	100	8	-	8	8	8	8	8	8	8	8	8	C	12
3947	0703	1,427	5,494	6,921	-	113	314	-	-	-	-	19	C	03-01	02-28	100	232	-	232	232	232	232	313	232	438	221	313	M	282
3948	0704	320	1,536	1,856	-	248	72	-	-	-	-	62	C	05-15	09-15	050	119	119	119	119	119	119	119	119	119	70	119	C	70
3949	0705	777	2,496	3,273	-	361	416	-	-	-	-	4	C	03-01	02-28	100	51	-	144	144	144	144	197	144	275	112	197	M	149
		(295)										23	Y	05-01	10-15	100	127	-											
3950	0706	280	640	920	-	-	280	-	-	-	-	8	C	03-01	02-28	100	93	-	93	93	93	93	93	93	93	48	93	C	48
3951	0330	3,815	30	3,845	606	2,775	434	-	-	-	-	37	H	04-01	11-30	100	292	-	369	369	369	369	567	369	752	318	567	I	521
3952	0709	73	118	191	-	22	51	-	-	-	-	1	C	03-01	02-28	100	11	-	11	11	11	11	15	11	21	9	15	I	11
3953	0634	196	1,240	1,436	-	196	-	-	-	-	-	3	C	03-01	02-28	100	36	-	36	36	36	36	36	36	36	36	36	C	50
3955	0714	983	1,107	2,090	-	983	-	-	-	-	-	18	C	03-01	02-28	100	221	-	221	221	221	221	271	221	379	221	271	M	271
3957	0716	2,827	6,800	9,627	-	995	1,668	-	164	-	-	125	S	03-01	02-28	100	307	-	713	713	713	713	652	713	913	476	652	I	476
												167	C	05-15	09-30	054	406	346											
3958	0717	40	5,721	5,761	-	10	30	-	-	-	-	1	C	05-01	06-15	100	2	-	7	7	7	7	7	7	7	5	7	C	8
														07-15	12-01	100	5	-											
3959	0718	2,321	14,128	16,449	844	1,058	419	-	-	-	-	250	C	04-15	11-15	009	158	1,592	398	398	398	398	676	398	834	376	676	M	634
3960	0719	1,103	15,348	16,451	-	562	523	-	18	-	-	15	C	03-01	02-28	100	181	-	181	181	181	181	181	181	181	159	181	C	216
3961	5422	218	4,300	4,518	-	218	-	-	-	-	-	7	C	03-01	02-28	100	82	-	82	82	82	82	82	82	82	60	82	C	60
3962	5429	656	7,411	8,067	-	561	95	-	-	-	-	18	C	03-01	02-28	100	219	-	219	219	219	219	182	219	255	170	182	M	170
3963	5431	91	1,280	1,371	17	-	46	-	28	-	-	2	C	03-01	02-28	100	21	-	21	21	21	21	21	21	21	11	21	C	11
3964	5443	361	8,800	9,161	-	361	-	-	-	-	-	12	C	03-01	02-28	100	138	-	138	138	138	138	106	138	148	106	138	M	106
3965	5448	4,422	24,492	28,914	-	2,290	2,122	10	-	-	-	67	C	03-01	02-28	100	804	-	808	808	808	808	916	808	1,281	726	916	M	726
3966	5450	6,738	70,005	76,743	-	3,656	2,912	-	170	-	-	70	C	03-01	02-28	100	833	-	833	833	833	833	974	833	1,364	768	974	M	803
3967	0635	80	776	856	-	80	-	-	-	-	-	1	C	03-01	02-28	100	11	-	11	11	11	11	11	11	11	11	11	C	15
3968	5464	160	9,280	9,440	-	81	79	-	-	-	-	4	C	03-01	02-28	100	42	-	42	42	42	42	42	42	42	33	42	C	33
3969	5465	40	5,518	5,558	-	40	-	-	-	-	-	1	C	03-01	02-28	100	8	-	8	8	8	8	8	8	8	8	8	C	7
3970	5527	53	400	453	-	53	-	-	-	-	-	2	C	03-01	02-28	100	18	-	18	18	18	18	18	18	18	15	18	C	15
3971	5543	160	5,120	5,280	-	64	96	-	-	-	-	2	C	03-01	02-28	100	19	-	19	19	19	19	19	19	19	16	19	C	16
3972	5576	98	1,200	1,298	-	-	98	-	-	-	-	1	C	03-01	02-28	100	9	-	9	9	9	9	9	9	9	5	9	C	18
3973	0722	935	7,800	8,735	-	595	322	18	-	-	-	18	C	03-01	02-28	100	214	-	214	214	214	214	214	214	214	201	214	C	225
3974	0723	40	1,427	1,467	-	40	-	-	-	-	-	1	C	03-01	02-28	100	11	-	11	11	11	11	11	11	11	7	11	C	7
3975	0724	420	2,380	2,800	-	420	-	-	-	-	-	6	C	03-01	02-28	100	69	-	69	69	69	69	69	69	69	69	69	C	113
3976	0725	4,062	4,604	8,666	-	3,807	255	-	-	-	-	148	C	03-01	02-28	022	385	1,391	733	733	733	733	807	733	1,130	724	807	M	783
												670	S	03-01	02-28	022	348	1,260											
3977	0747	4,001	4,857	8,858	-	2,889	1,112	-	-	-	-	140	C	03-01	02-28	023	386	1,294	646	646	646	646	582	646	816	502	582	M	502
												470	S	03-01	02-28	023	260	868											
3978	0727	517	2,720	3,237	-	252	265	-	-	-	-	37	S	03-01	02-28	100	89	-	89	89	89	89	89	89	89	66	89	C	66
3979	0728	4,708	7,717	12,425	-	1,484	3,224	-	-	-	-	4	C	03-01	02-28	100	44	-	931	931	931	931	1,349	931	1,888	480	1,349	I	977
												788	Y	04-15	09-15	026	1031	2,909											
												1000	S	04-15	09-15	026	262	738											
3980	0729	167	1,310	1,477	-	-	160	-	-	-	7 A	4	C	03-01	02-28	100	52	-	52	52	52	52	52	52	52	29	52	C	29

Gr. Rec. No.	Allot No.	Pub. Acres	Other Acres	Total Acres	E.	G.	F.	P.	U.	B C W	A D R	No. of Lvs	Cl	Season of Use		%Pu. AUMs	PD Act. AUMS	Other AUMs	PD Pref AUMs	Alt A		Alt B		Alt C		Alt D		M C I	Current Prod. AUMs
																				ST	LT	ST	LT	ST	LT	ST	LT		
3985	0720	40	17,189	17,229	. -	-	40	-	-	-	-	1	C	03-01	02-28	100	12	-	12	12	12	12	12	12	12	5	12	C	5
3986	0721	7,809	15,649	23,458	516	5,650	1,530	102	11	-	-	1100	Y	05-01	10-10	031	1630	4,233	1,630	1,630	1,630	1,620	1,884	1,630	2,583	1,571	1,884	M	1,706

E = excellent condition
G = good condition
F = fair condition
P = poor condition
U = Unsuitable
B = tame pastures
C = contour furrows
W = waterspreaders
A = agricultural lands
D = abandoned croplands
R = agricultural research study plot
Lvs = Livestock
Cl = Class

UTILIZATION COMPUTATION

The acreage and range condition of each range site provided the base for making projections of increased grazing capacity in response to management. The following procedures were used to establish the short- and long-term allocation in each alternative.

ALTERNATIVE A

Short- and long-term: The present utilization was used. It was originally developed by applying proper use factors, actual use values and the initial stocking rate guide found in SCS Technicians Guide. The high percentage of good and excellent range in the Resource Area verifies the adequacy of the guides. Those areas in less than good condition are generally the result of some management problem (primarily caused by livestock distribution resulting from water, fencing, tame pasture, repeated same season grazing, etc.) which results in overuse of an area; not in an over allocation of vegetation. The allocation is closely approximated by the formula: Grazing Capacity - Site Production x .25 divided by Monthly Forage Requirements. The initial vegetation allocation was: 25% to livestock, 75% to wildlife, watershed and other nonconsumptive uses.

PREFERRED ALTERNATIVE, ALTERNATIVE B, ALTERNATIVE C

Same discussion as in Alternative A. However, based on range improvement and grazing management, allotment adjustments would be considered following a five-year monitoring period and with the cooperation of the operator. Insignificant livestock adjustment would be allowed using a shorter monitoring period.

ALTERNATIVE D

Watershed and Wildlife Enhancement

Short-term utilizations were achieved by subtracting the watershed/soils and wildlife demands from the short-term utilizations in Alternative B from the allotments that had fair and poor condition lands. In the long term only wildlife protection would require allocation reductions. Proper management in the short term should bring the fair and poor condition range up to mid-good, eliminating the need for watershed/soils protection reductions in the long term.

Watershed/soils demands were that the areas in fair and poor condition would be restricted from grazing during April, May and June.

Wildlife demands included various deferment treatments that can be found in Appendix H.

NO GRAZING

Same discussion as in Alternative A. However, there is no use for livestock; all vegetation is for wildlife, watershed and other nonconsumptive uses.

APPENDIX F
ALTERNATIVES IMPLEMENTATION COSTS

The cost of implementing each alternative is shown below. Cost items included are: construction (labor and materials); overhead (project implementation, design, administration). Cultural clearance costs are not included.

		ALTERNATIVES			
Construction and Overhead	**Preferred**	**A**	**B**	**C**	**D**
Fences @ $2800.00/mi	$280,000	$168,000	$280,000	$840,000	$280,000
Water sources (wells, pipelines, reservoirs/pits, springs)	2,025,000	2,100,000	2,025,000	5,175,000	2,025,000
Mechanical Treatment $20.00/acre	2,500,460	90,000	2,500,460	10,370,980	2,500,460
Noxious Weed Control $850.00/acre (Control requires 5 yrs x $170.00/acre = 850 acre total treatment cost)	1,657,500	1,657,500	1,657,500	1,657,500	1,657,500
Prairie Dog Control $7.00/acre	3,000	3,000	3,000	3,000	3,000
TOTAL	$6,465,960	$4,018,500	$6,465,960	$18,043,680	$6,465,960

Maintenance costs are included in these alternatives.

Fire treatments are not included in these alternatives.

APPENDIX G

LAND PATTERN REVIEW CRITERIA

The public lands subject to these criteria are those lands, minerals, or interests in land administered by BLM. Criteria are presented to assist in categorizing the public lands for retention, disposal, or further study. Criteria are also provided to facilitate the selection of lands to be received in exchanges or other types of acquisition. The criteria range from specific to general and are designed to provide direction for statewide consistency while allowing the manager flexibility in identifying circumstances which dictate the category in which lands can be placed.

A. Retention—These are lands which will remain in public ownership and be managed by BLM. BLM is interested in exchanges to improve manageability of areas important with public values. Although the underlying philosophy is long term public ownership, minor adjustments involving sales and exchanges of lands may occur when the public interest is better served.

1. Areas of national environmental significance, including but not limited to:
    a. Wilderness and Wilderness Study Areas
    b. Wild & Scenic Rivers
    c. National & Historic Trails
    d. National Conservation Areas
    e. Wetlands and Riparian Areas under Executive Order 11990
    f. Other Congressionally Designated Areas
    g. Wild Horse Management Areas
    h. Areas of Critical Environmental Concern

2. Areas of national economic significance including, but not limited to:
    a. Designated Mineral Resource Areas where disposal of the surface would unnecessarily interfere with the logical development of the mineral estate, e.g. surface minerals, coal, phosphate, known geologic structures, etc.
    b. Publc lands containing strategic minerals needed for national defense.

3. Public lands used in support of national defense, including but not limited to National Guard maneuver areas.

4. Areas where management is cost-effective or lands containing other important characteristics and public values which can best be managed in public ownership by BLM, including but not limited to:
    a. key tracts along rivers and lakes
    b. community watersheds and/or floodplains
    c. wildlife priority areas as identified for land selection
    d. important hunting or fishing areas

5. Lands with a combination of broad multiple use values which dictate they should be retained in public ownership and managed by BLM.

6. Areas where future plans will lead to further consolidation and improvement of land patterns and reduce the costs of management.

7. Areas which the general public, state and local government consider suitable for permanent public ownership.

8. Public lands withdrawn by the BLM or other federal agency for which the purpose of the withdrawal remains valid and the resource uses can be managed by BLM concurrently.

9. Public lands that contribute significantly to the stability of the local economy by virtue of federal ownership.

10. Public lands which provide public access and contain previously mentioned public values which, when considered together, warrant their retention.

B. Disposal—These are lands identified for potential removal from public ownership through sale or exchange, or through transfer to federal, state, county or local public entities. In addition to land internally identified for disposal, BLM will respond to proposals from the public. Disposal decisions will be made in the public interest based upon the following criteria:

1. Lands specifically identified through land use plans for sale, exchange, transfer or Recreation and Public Purposes Act applications.

2. Lands of limited public value.

3. Widely scattered parcels which are difficult for BLM to manage with anything beyond minimal custodial administration.

4. Lands with high public values proper for management by other federal agencies, or state or local government.

5. Lands around expanding communities and available for community expansion.

6. Lands where disposal would aid in aggregating or repositioning other public lands or public land resource values in retention areas to facilitate national, state and local objectives.

7. Lands acquired for a specific federal purpose which are no longer required for that or any other federal purpose.

8. Good Neighbor applications filed under Secretary of the Interior policy of January 1981, initiated before March 1, 1982, and filed and perfected before September 1, 1982.

9. Lands with long term unauthorized use problems, and are not required for specific public purposes.

10. Lands where disposal would increase the range of economic opportunities provided to the general public.

11. Lands designated for agricultural, commercial or industrial development as the highest value or most appropriate long-term use.

12. Lands involved in BLM/FS jurisdictional transfer, state indemnity selections, ongoing exchanges will continue as initiated.

C. Further Study—Lands that fail to clearly meet either retention or disposal criteria, will be subject to further study. Lands in this category will include:

1. Lands where disposition would pose questions as to consistency with other federal, state, local government or tribal land use plans.

2. Lands under withdrawal review.

3. Lands where less than full fee conveyance would reserve specifically identified significant public values to protect public interests.

4. Lands where management is not cost-effective, but not clearly negative, and multiple use values are marginal.

5. Lands where cooperative management best serves the public interest in the short term.

6. Lands with potential future public use—based on developing needs.

7. Lands with potential for transfer under the Good Neighbor program.

8. Lands in areas of public access deficiencies.

D. Selection Criteria—Used to evaluate proposals which would result in the transfer of lands or minerals to the Bureau of Land Management through exchange or other transactions.

These criteria help to assure that any BLM decision to acquire a tract of land provides significant public benefits. The criteria range from "general" standards, against which to evaluate all proposals, to "specific" guidelines covering the selected or prioritized program areas.

These standards are designed to provide consistent direction, while allowing the line manager flexiblity to meet local, state and natioal needs.

General Criteria

All proposals will be evaluated to determine if the selected lands will:

1. Facilitate access to areas retained for long-term public use.

2. Be primarily focused in the "retention" areas. Acquisition in "Further Study" areas or "disposal" areas will only be considered if the action leads to and/or facilitates long-term needs or program objectives.

3. Facilitate national, state and local BLM priorities or mission statement needs.

4. Place emphasis where BLM land use or activity plans are completed. Proposals must facilitate implementation and/or be consistent with these plans.

5. Stabilize or enhance local economics or values.

6. Meet long-term goals instead of short-term gains.

7. Be of sufficient size to improve use of adjoining public lands or, if isolated, large enough in scale to allow the identified potential public land use.

8. Allow more diverse use, more intensive use, or a change in uses to better fulfill the Bureau's mission.

9. Maintain or enhance important and recognized public land values. Especially noteworthy are identified, designated, special or high interest value areas.

10. Enhance the opportunity for new or emerging public land uses or values.

11. Contribute to a wide spectrum of uses or a large number of public land users.

12. Facilitate management practices, uses, scale of operations or degrees of management intensity that are viable under economic program efficiency standards.

APPENDIX H
ALTERNATIVE D GRAZING AUM ALLOCATIONS

Reductions were identified for watershed/soils protection, for a variety of wildlife enhancements, and for resource protection. The symbols from the main table are listed below in their order of appearance:

SYMBOL	CONCERN	RESOURCE PROTECTION GOAL	PRIMARY TECHNIQUES*
WS	Watershed/Soil	Improve ground cover on less than good range	Spring deferment (April,May,June)
MD	Mule Deer High Use Area	Improve forb and browse density	Limit spring & fall grazing
AW	Antelope Winter Range	Increase winter browse supply	No grazing after 15 Aug
ST	Sharptail Lek	Protect nests and increase forbs	No spring grazing
MDW	Mule Deer Winter Range	Increase winter browse supply	No grazing after 15 Aug
WTW	Whitetail Deer Winter Range	Increase winter browse supply	No grazing after 15 Aug
RP	Resource Protection	Increase available AUMs to current license	Various site specific techniques
T	Turkey High Use Area	Increase winter browse supply	No grazing after 15 Aug
SGW	Sage Grouse Winter Range	Increase winter browse supply	No grazing after 15 Aug
WF	Waterfowl Nesting	Provide residual ground cover for nesting	Fence part of reservoir
PD	Prairie Dog Towns	Maintain prairie dog towns	No range improvements
BF	Black-footed Ferret Area	Maintain ferret habitat	No range improvements
SG	Sage Grouse Lek	Protect nests and increase forbs	No spring grazing
WT	Whitetail Deer High Use Area	Improve forb and browse density	Limit spring and fall grazing
A	Antelope High Use Area	Increase forb density	No spring grazing
BH	Bighorn Sheep Area	Increase forb density	No spring grazing

*Each allotment must be inventoried and monitored prior to any livestock adjustment. These studies will identify the best management techniques to be used on a site specific basis to attain the resource protection goal; they may differ from the primary technique.

Some management techniques may not require a reduction in preferenced AUMs. However, it was necessary to assume the worst case of preferenced reductions in order to construct a table which shows the extent of concern for environmental protection in each allotment. Short-term reductions were taken from the current preference. Long-term reductions were taken from the long-term AUMs of Alternative "B"; this allows for range improvements in "M" and "I" category allotments.

Reductions were made for watershed/soils protection on all allotments having any acreage in less than good range condition. Reductions amounted to the number of AUMs taken from less than good condition range during the months of April, May and June. Proper management in the short term should bring that range up to mid-good condition, eliminating the need for reductions for watershed/soils protection in the long term.

Reductions were made for wildlife protection or enhancement in both the short and long terms. The wildlife values of every allotment were identified. In any allotment where the wildlife values occurred on federal range in less than good condition, livestock reductions have been proposed. Intensive management in these areas is aimed at both improved range condition and enhanced wildlife habitat.

Reductions for resource protection were made to bring preferenced use down to current available forage levels. Those allotments identified for resource protection reductions are the most likely to have potential reductions adjusted after study and monitoring because of the questions surrounding the estimates of current available AUMs. Proper management in the short term should bring that range back up to the current preferenced use, eliminating the need for reductions for resource protection in the long term.

AUM CHANGES PROPOSED IN ALTERNATIVE D BY ALLOTMENT

		SHORT TERM			LONG TERM			
GR NUMBER	PREF. AUMs	AUMs	CHANGE + or -	REDUCTION BREAKDOWN	AUMS	CHANGE + or -	REDUCTION BREAKDOWN	CHANGE FROM PREF. AUMS
3301	12	10	-2	2 WS	12	-	-	-
3302	122	82	-40	13 WS, 27 MD	95	-27	27 MD	-27
3304	112	92	-20	6 WS, 11 AW 3 RP	101	-11	11 AW	-11
3306	142	125	-17	17 WS	142	-	-	-
3307	179	108	-71	24 WS, 47 AW	132	-47	47 AW	-47
3309	115	63	-52	23 WS, 29 ST	86	-29	29 ST	-29
3310	101	95	-6	1 WS, 5 MD	96	-5	5 MD	-5
3311	865	684	-181	123 WS, 58ST MDW, WTW	983	-58	58ST, MDW WTW	+118
3312	526	288	-238	36 WS, 202RP	385	-	-	-141
3313	150	127	-23	23 WS	150	-	-	-
3314	85	75	-10	6 WS, 4 RP	85	-	-	-
3316	72	64	-8	8 WS	72	-	-	-
3318	297	206	-91	57 WS, 34T	539	-34	34 T	+242
3319	427	412	-15	3 WS, 12 SGW	415	-12	12 SGW	-12
3321	172	144	-28	28 WS	172	-	-	-
3322	378	228	-150	55 WS, 95 MD	400	-95	95 MD	+22
3323	3	1	-2	2WS	3	-	-	-
3324	234	192	-42	36 WS, 2 WF, 4 RP	286	-2	2 WF	+52
3325	1445	1276	-169	95 WS, 74 T	1478	-74	74 T	+33
3326	382	313	-69	26 WS, 42 MD 1 RP	340	-42	42 MD	-42
3327	277	150	-127	6 WS, 121 RP	277	-	-	-
3328	8	6	-2	2 RP	8	-	-	-
3329	110	66	-44	26 WS, 18 MD	225	-18	18 MD	+115
3330	30	26	-4	4 WS	30	-	-	-
3333	190	157	-33	33 WS	190	-	-	-
3334	114	111	-3	3 WS	114	-	-	-
3335	51	47	-3	3 WS	51	-	-	-
3336	236	201	-35	30 WS, 5 RP	236	-	-	-
3338	93	73	-20	4WS,3ST,13RP	90	-3	3 ST	-3
3339	47	13	-34	2 WS, 32 RP	47	-	-	-
3340	24	20	-4	4 WS	24	-	-	-
3342	39	33	-6	6 WS	39	-	-	-
3343	76	72	-4	4 WS	76	-	-	-
3344	383	328	-55	36WS,19MDW T	364	-19	19 MDW, T	-19
3345	93	84	-9	9 WS	93	-	-	-
3346	180	156	-24	24 WS	180	-	-	-
3349	1280	1191	-89	51 WS, 38 RP	1280	-	-	-
3350	211	168	-43	43 WS	345	-	-	+134
3351	172	138	-34	11 WS, 23 RP	172	-	-	-
3352	59	45	-14	14 WS	59	-	-	-

		SHORT TERM			LONG TERM			
GR NUMBER	PREF. AUMs	AUMs	CHANGE + or -	REDUCTION BREAKDOWN	AUMS	CHANGE + or -	REDUCTION BREAKDOWN	CHANGE FROM PREF. AUMs
3353	103	79	-24	15 WS, 9 RP	103	-	-	-
3354	73	70	-3	3 WS	73	-	-	-
3355	28	19	-9	5 WS, 4 RP	28	-	-	-
3356	18	16	-2	2 WS	18	-	-	-
3358	188	154	-34	17 WS, 17 MDW	367	-17	17 MDW	+179
3359	50	49	-1	1 WS	50	-	-	-
3360	43	28	-6	6 WS	43	-	-	-
3361	86	78	-8	8 RP	86	-	-	-
3362	17	11	-6	6 WS	17	-	-	-
3363	513	438	-75	57 WS,18 MDW WTW	854	-18	18MDW,WTW	+341
3364	97	63	-34	16WS,1PD,17RP	96	-1	1 PD	-1
3365	407	386	-21	21 WS	527	-	-	+120
3368	14	11	-3	3 WS	14	-	-	-
3370	31	12	-19	19 RP	31	-	-	-
3371	104	86	-18	18 WS	104	-	-	-
3373	51	34	-17	6 WS, 11 RP	51	-	-	-
3374	78	62	-16	16 WS	78	-	-	-
3375	32	29	-3	3 WS	32	-	-	-
3376	95	79	-16	16 WS	95	-	-	-
3378	232	150	-82	24 WS, 58 RP	232	-	-	-
3379	55	54	-1	1 WS	55	-	-	-
3380	1018	870	-148	61 WS, 87 MDW	1208	-87	87 MDW	+190
3381	695	577	-118	118 WS	1037	-	-	+342
3382	332	281	-34	34 WS	332	-	-	-
3383	47	40	-7	1 WS, GRP	47	-	-	-
3384	5	4	-1	1 RP	5	-	-	-
3388	113	107	-6	6 WS	113	-	-	-
3389	185	169	-16	16 WS	226	-	-	+41
3390	67	34	-33	9 WS, 24 RP	67	-	-	-
3392	11	10	-1	1 WS	11	-	-	-
3393	220	189	-31	18 WS, 13 RP	236	-	-	+16
3395	70	66	-4	4 WS	70	-	-	-
3396	60	58	-2	2 WS	60	-	-	-
3398	116	58	-58	3 WS, 55 RP	66	-	-	-50
3399	20	16	-4	4 WS	20	-	-	-
3401	1538	1518	-20	20 WS	2151	-	-	+613
3402	3	1	-2	2 WS	3	-	-	-
3404	12	6	-6	1 WS, 5 RP	12	-	-	-
3405	50	35	-15	15 RP	50	-	-	-
3407	139	136	-3	3 WS	172	-	-	+33
3408	277	395	-24	24 WS	395	-	-	+118
3409	16	15	-1	1 RP	16	-	-	-
3410	21	13	-8	3 WS, 5 RP	21	-	-	-
3411	6	5	-1	1 WS	6	-	-	-
3412	28	11	-17	3 WS, 14 RP	28	-	-	-

GR NUMBER	PREF. AUMs	SHORT TERM AUMs	CHANGE + or -	REDUCTION BREAKDOWN	LONG TERM AUMS	CHANGE + or -	REDUCTION BREAKDOWN	CHANGE FROM PREF. AUMs
3414	26	25	-1	1 WS	26	-	-	-
3417	20	17	-3	3 WS	20	-	-	-
3418	123	110	-13	13 WS	287	-	-	+164
3419	3	0	-3	3 RP	3	-	-	-
3421	101	77	-24	24 WS	173	-	-	+72
3430	178	171	-7	7 WS	178	-	-	-
3432	358	312	-46	46 WS	358	-	-	-
3434	20	18	-2	2 WS	20	-	-	-
3435	31	26	-5	5 WS	31	-	-	-
3436	429	407	-22	22 WS	669	-	-	+240
3437	1701	1192	-509	83 WS, 426 RP	1284	-	-	-417
3438	52	51	-1	1 WS	52	-	-	-
3439	527	469	-58	58 RP	527	-	-	-
3440	1137	1066	-71	46 WS, 25 RP	1145	-	-	+8
3442	1729	1327	-402	127 WS,275 RP	1668	-	-	-61
3443	30	15	-15	4 WS, 11 RP	30	-	-	-
3444	248	212	-36	1WS,5BF,30RP	243	-5	5 BF	-5
3445	1167	1154	-13	13 WS	1524	-	-	+357
3446	15	6	-9	1 WS, 8 RP	15	-	-	-
3447	604	435	-169	76WS,6PD,87RP	631	-6	6 PD	+27
3448	27	22	-5	5 RP	27	-	-	-
3449	123	119	-4	4 WS	123	-	-	-
3450	388	366	-22	15 WS, 7 RP	407	-	-	+19
3451	92	69	-23	5 WS, 18 BF	74	-18	18 BF	-18
3453	340	190	-150	34 WS, 116 RP	309	-	-	-31
3454	51	50	-1	1 WS	99	-	-	+48
3455	1495	1260	-235	130 WS, 63 AW 42 RP	1495	-63	63 AW	-
3456	14	12	-2	2 WS	14	-	-	-
3457	147	106	-41	41 RP	147	-	-	-
3458	2281	2092	-189	94 WS, 95 RP	2349	-	-	+68
3459	112	101	-11	4 WS, 7 RP	112	-	-	-
3460-0183	498	473	-25	25 WS	773	-	-	+275
3460-0309	190	180	-10	10 WS	294	-	-	+104
3461	67	54	-13	13 WS	67	-	-	-
3462	513	447	-66	66 RP	513	-	-	-
3463	1142	1097	-45	45 RP	1101	-	-	-
3464	1104	815	-289	267 WS, 22 AW	1216	-22	22 AW	+112
3465	26	20	-6	2 WS, 4 RP	26	-	-	-
3466	956	955	-1	1 WS	1488	-	-	+532
3467	525	517	-8	8 WS	829	-	-	+304
3468	32	29	-3	3 RP	32	-	-	-
3470	365	332	-33	26 WS, 7 RP	404	-	-	+39
3471	1341	1032	-309	15 WS, 294 RP	1069	-	-	-272
3472	8	5	-3	3 WS	8	-	-	-
3473	88	65	-23	23 WS	125	-	-	+37

		SHORT TERM			LONG TERM			
GR NUMBER	PREF. AUMs	AUMs	CHANGE + or -	REDUCTION BREAKDOWN	AUMS	CHANGE + or -	REDUCTION BREAKDOWN	CHANGE FROM PREF. AUMs
3476	272	270	-2	2 WS	279	-	-	+7
3477-0731	16	14	-2	1 WS, 1 RP	16	-	-	-
3478	1992	1986	-6	6 WS	2501	-	-	+509
3479	39	37	-2	2 WS	39	-	-	-
3481-0203	110	107	-3	3 WS	226	-	-	+116
3481-0693	323	317	-6	6 WS	382	-	-	+59
3482	740	476	-264	54 WS, 210 RP	632	-	-	-108
3483	36	25	-11	1 WS, 10 RP	36	-	-	-
3484	30	26	-4	4 WS	30	-	-	-
3489	215	140	-75	75 RP	215	-	-	-
3490	216	175	-41	41 WS	216	-	-	-
3491	58	56	-2	2 RP	58	-	-	-
3492	648	628	-20	3 WS, 17 RP	636	-	-	-12
3493	473	455	-18	15 WS, 3 RP	537	-	-	+64
3494	40	34	-6	6 RP	40	-	-	-
3495	42	35	-7	7 RP	42	-	-	-
3496	1288	1206	-82	82 WS	1834	-	-	+546
3497	771	714	-57	57 WS	909	-	-	+138
3498	227	216	-9	9 WS	345	-	-	+118
3499	2275	2090	-185	77 WS, 108 RP	2220	-	-	-55
3500	428	421	-7	7 WS	513	-	-	+85
3501	108	87	-21	21 WS	108	-	-	-
3503	130	128	-2	2 WS	130	-	-	-
3506	30	21	-9	4 WS, 5 RP	30	-	-	-
3507	55	22	-33	5 WS, 28 RP	36	-	-	-19
3508	2465	1916	-549	53 WS, 22 AW, 474 RP	2040	-22	22 AW	-425
3509	66	45	-21	3 WS, 18 RP	66	-	-	-
3510	1231	874	-357	18 WS, 15 AW, 324 RP	909	-15	15 AW	-322
3512	404	370	-34	34 WS	727	-	-	+323
3513	386	352	-34	34 WS	517	-	-	+131
3514	989	959	-30	30 WS	1126	-	-	+137
3519	119	90	-29	9 WS, 20 T	226	-20	20 T	+107
3520	6	4	-2	2 WS	6	-	-	-
3521	734	732	-2	2 WS	1032	-	-	+298
3522	610	535	-75	31WS,1SG,43RP	617	-1	1 SG	+7
3523	172	137	-35	35 WS	311	-	-	+139
3524	7	5	-2	2 WS	7	-	-	-
3526	39	35	-4	4 WS	39	-	-	-
3529	407	393	-14	14 WS	547	-	-	+140
3532	13	10	-3	3 RP	13	-	-	-
3534	48	33	-15	1 WS, 14 RP	48	-	-	-
3537	59	35	-24	8 WS, 16 RP	59	-	-	-
3539	1141	1120	-21	21 WS	1675	-	-	+534
3540	168	135	-33	12 WS, 21 RP	168	-	-	-

GR NUMBER	PREF. AUMs	SHORT TERM AUMs	CHANGE + or -	REDUCTION BREAKDOWN	LONG TERM AUMS	CHANGE + or -	REDUCTION BREAKDOWN	CHANGE FROM PREF. AUMs
3543	12	11	-1	1 RP	12	-	-	-
3545	16	14	-3	3 WS	16	-	-	-
3546	961	872	-89	80 WS, 9 RP	1110	-	-	+149
3548	351	343	-8	8 WS	351	-	-	-
3550-0682	326	305	-21	21 WS	512	-	-	+186
3550-0683	160	150	-10	10 WS	327	-	-	+167
3551	44	42	-2	2 WS	177	-	-	+133
3552	2406	2289	-117	96 WS, 21 RP	2430	-	-	+24
3553	44	26	-18	5 WS, 13 RP	44	-	-	-
3556	23	15	-8	4 WS, 4 RP	23	-	-	-
3557	281	210	-71	11 WS, 60 RP	238	-	-	-43
3559	115	105	-10	9 WS, 1 RP	128	-	-	+13
3560	114	107	-7	7 WS	217	-	-	+103
3561	1470	1425	-50	3 WS, 47 RP	1436	-	-	-34
3562	22	15	-7	3 WS, 4 RP	22	-	-	-
3563	219	90	-129	13 WS, 114 RP	219	-	-	-
3564	40	39	-1	1 WS	40	-	-	-
3565	183	161	-22	22 WS	434	-	-	+251
3566	16	12	-4	4 WS	16	-	-	-
3567	4	2	-2	2 WS	4	-	-	-
3568	72	67	-5	5 WS	72	-	-	-
3569	73	65	-1	1 WS	68	-	-	-5
3570	271	263	-8	8 WS	350	-	-	+79
3571	67	32	-35	5 WS, 30 RP	67	-	-	-
3572	496	353	-143	31 WS, 112 RP	432	-	-	-64
3573	306	298	-8	8 WS	394	-	-	+88
3574	329	328	-1	1 WS	441	-	-	+112
3575	597	431	-166	31 WS, 135 RP	513	-	-	-84
3576	281	255	-26	26 WS	414	-	-	+133
3579	1052	1042	-10	10 WS	2096	-	-	+1044
3580	245	137	-108	8 WS, 100 RP	245	-	-	-
3581	844	812	-32	32 WS	1032	-	-	+188
3582	143	96	-47	12 WS, 35 RP	143	-	-	-
3584	255	223	-32	11 WS, 21 RP	252	-	-	-3
3586	592	367	-225	82 WS, 143 RP	587	-	-	-5
3587	1224	1022	-202	4 WS, 198 RP	1035	-	-	-189
3588	191	171	-20	12 WS, 8 RP	191	-	-	-
3590	223	222	-1	1 WS	223	-	-	-
3591	23	17	-6	6 WS	23	-	-	-
3592	51	43	-8	8 Ws	51	-	-	-
3593	476	307	-169	11 WS, 158 RP	422	-	-	-54
3594	8	6	-2	1 WS, 1 RP	8	-	-	-
3596	156	143	-13	13 WS	156	-	-	-
3597	189	163	-26	13 WS, 13 RP	189	-	-	-
3598	72	57	-15	11 WS, 4 RP	72	-	-	-
3600	100	99	-1	1 WS	100	-	-	-

		SHORT TERM			LONG TERM			
GR NUMBER	PREF. AUMs	AUMs	CHANGE + or -	REDUCTION BREAKDOWN	AUMS	CHANGE + or -	REDUCTION BREAKDOWN	CHANGE FROM PREF. AUMs
3601	108	74	-34	12 WS, 22 RP	108	-	-	-
3602-0325	563	476	-87	87 WS	637	-	-	+74
3602-0715	652	551	-101	101 WS	747	-	-	+95
3603	1684	732	-952	573 WS,379 RP	1046	-	-	-638
3604	181	152	-29	29 WS	238	-	-	+57
3605	62	60	-2	2 WS	62	-	-	-
3606	101	94	-7	7 WS	101	-	-	-
3607	590	553	-37	3 WS, 34 RP	561	-	-	-29
3610	83	63	-20	20 WS	83	-	-	-
3611	149	145	-4	4 WS	149	-	-	-
3612	15	6	-9	1WS,6BF,2RP	9	-6	6 BF	-6
3613	68	41	-27	6 WS, 21 RP	68	-	-	-
3614	447	437	-10	10 WS	471	-	-	+24
3615	422	330	-92	28 WS, 64 RP	404	-	-	-18
3617	286	257	-29	29 RP	286	-	-	-
3618	55	30	-25	5 WS, 20 BF	35	-20	20 BF	-20
3619	415	413	-2	2 WS	944	-	-	+529
3620	695	645	-50	50 WS	830	-	-	+135
3621	31	20	-11	5 WS, 6 RP	31	-	-	-
3622	424	321	-103	103 WS	602	-	-	+178
3608	609	332	-277	45 WS, 232 RP	470	-	-	-139
3625	5	3	-2	2 WS	5	-	-	-
3627	10	8	-2	1 WS, 1 RP	10	-	-	-
3628	35	22	-13	5 WS, 8 RP	35	-	-	-
3629	81	66	-15	2 WS, 13 RP	81	-	-	-
3630	24	20	-4	4 WS	24	-	-	-
3631	73	72	-1	1 WS	73	-	-	-
3632	486	480	-6	6 WS	504	-	-	+18
3634	93	80	-13	1 WS, 12 RP	93	-	-	-
3635	13	10	-3	1 WS, 2 RP	13	-	-	-
3636	838	793	-45	45 WS	933	-	-	+95
3637	727	469	-258	80 WS, 178 RP	681	-	-	-46
3638	570	427	-143	143 WS	639	-	-	+69
3639	781	435	-346	77 WS, 269 RP	639	-	-	-142
3642	1297	1144	-153	14 WS, 139 RP	1183	-	-	-114
3643	69	38	-31	7 WS, 24 RP	69	-	-	-
3644	228	161	-67	24 WS, 43 RP	228	-	-	-
3647	2097	1693	-404	67 WS, 337 RP	1889	-	-	-208
3649	761	594	-167	123 WS,44MDWT	831	-44	-	+70
3650	32	22	-10	5 WS, 5 RP	32	-	-	-
3651	72	51	-21	5 WS, 16 RP	72	-	-	-
3652	57	50	-7	7 RP	57	-	-	-
3653	168	160	-8	8 WS	186	-	-	+18
3654	22	14	-8	3 WS, 5 RP	22	-	-	-
3655	10	6	-4	2 WS, 2 RP	10	-	-	-
3656	96	56	-40	1 WS, 39 RP	96	-	-	-

GR. NUMBER	PREF. AUMs	AUMs	SHORT TERM CHANGE + or -	REDUCTION BREAKDOWN	AUMS	LONG TERM CHANGE + or -	REDUCTION BREAKDOWN	CHANGE FROM PREF. AUMs
3657	816	778	-38	15 WS, 23 A	861	-23	23 A	+45
3659	13	9	-4	4 RP	13	-	-	-
3660	60	49	-11	11 WS	60	-	-	-
3661	523	397	-126	94 WS, 32 RP	498	-	-	-25
3663	668	662	-6	6 WS	840	-	-	+172
3665	287	282	-5	5 WS	310	-	-	+23
3666	566	441	-125	51 WS, 74 RP	577	-	-	+11
3668	922	830	-92	13 WS, 79 RP	843	-	-	-79
3670	80	77	-3	3 WS	80	-	-	-
3672	349	253	-96	31 WS, 65 MD	307	-65	65 MD	-42
3673	59	53	-6	6 WS	59	-	-	-
3674	18	12	-6	6 RP	18	-	-	-
3675	106	105	-1	1 WS	124	-	-	+18
3676	38	21	-17	17 RP	38	-	-	-
3677	675	641	-34	34 WS	795	-	-	+120
3678	320	181	-139	42 WS, 97 RP	303	-	-	-17
3679	16	14	-2	2 WS	16	-	-	-
3680	230	224	-6	6 WS	230	-	-	-
3681	118	113	-5	5 WS	133	-	-	+15
3682	158	140	-18	5 WS, 13 RP	158	-	-	-
3683	11	7	-4	4 RP	11	-	-	-
3684	11	9	-2	2 WS	11	-	-	-
3685	443	308	-135	32 WS, 103 RP	394	-	-	-49
3689	638	490	-148	78 WS, 70 RP	637	-	-	-1
3691	1135	982	-153	60 WS, 93 RP	1142	-	-	+7
3692	168	124	-44	3 RP	128	-	-	-40
3693	6	3	-3	7 WS	6	-	-	-
3694	45	38	-7	7 WS	45	-	-	-
3695	199	174	-25	10 WS, 15 RP	202	-	-	+3
3696	1925	1792	-133	9 WS, 124 RP	1817	-	-	-108
3697	1429	1105	-324	306 WS, 18 MD	1778	-18	18 MD	+349
3698	446	371	-75	31 WS, 44 MD	470	-44	44 MD	+24
3699	216	175	-41	5 WS, 36 RP	216	-	-	-
3702	538	432	-106	14 WS, 92 RP	469	-	-	-69
3703	59	45	-14	14 WS	59	-	-	-
3704	24	17	-7	7 WS	24	-	-	-
3705	57	49	-8	4 WS, 4 RP	57	-	-	-
3708	130	81	-49	20 WS, 29 RP	130	-	-	-
3709	105	68	-37	17 WS, 20 RP	105	-	-	-
3710	578	251	-327	4 WS, 323 RP	329	-	-	-249
3711	142	123	-19	19 WS	331	-	-	+189
3712	21	14	-7	3 WS, 4 RP	21	-	-	-
3713	200	190	-10	10 RP	200	-	-	-
3715	690	485	-205	175 WS, 30 AW	1201	-30	30 AW	+511
3716	117	107	-10	10 WS	117	-	-	-
3717	298	230	-68	2 WS, 66 RP	298	-	-	+222

GR NUMBER	PREF. AUMs	AUMs	CHANGE + or -	REDUCTION BREAKDOWN	AUMS	CHANGE + or -	REDUCTION BREAKDOWN	CHANGE FROM PREF. AUMs
3719	357	248	-109	30 WS, 79 RP	333	-	-	-24
3721	105	101	-4	4 WS	105	-	-	-
3722	120	118	-2	2 WS	120	-	-	-
3723	56	45	-11	11 WS	56	-	-	-
3724-0252	50	49	-1	1 WS	50	-	-	-
3724-0448	82	80	-2	2 WS	82	-	-	-
3725	12	7	-5	2 WS, 3 RP	12	-	-	-
3726	1000	943	-57	57 WS	2042	-	-	+1042
3727	143	30	-113	25 WS, 88 MD	81	-88	88 MD	-32
3729	729	583	-146	72 WS, 74 RP	739	-	-	+10
3731	155	116	-39	8 WS, 31 BF	124	-31	31 BF	-31
3732	1940	1921	-19	19 WS	2997	-	-	+1057
3733	96	88	-8	8 WS	96	-	-	-
3736	2755	2667	-88	99 WS	4238	-	-	+1483
3737	1116	963	-153	45 WS, 108 RP	1057	-	-	-59
3739	300	296	-4	4 WS	433	-	-	+133
3741	16	12	-4	4 RP	16	-	-	-
3742	36	29	-7	7 RP	36	-	-	-
3743	269	263	-6	6 WS	605	-	-	+336
3744	56	55	-1	1 WS	76	-	-	+20
3746	38	35	-3	3 WS	38	-	-	-
3748	520	442	-78	78 WS	748	-	-	+228
3751-0477	104	100	-4	4 WS	110	-	-	+10
3751-0681	236	227	-9	9 WS	245	-	-	+9
3753	13	11	-2	2 RP	13	-	-	-
3754	113	94	-19	19 WS	113	-	-	-
3755	272	260	-12	12 WS	309	-	-	+37
3756	13	11	-2	2 RP	13	-	-	-
3757	211	172	-39	3 WS, 36 RP	211	-	-	-
3758	129	90	-39	8 WS, 31 RP	129	-	-	-
3759	864	842	-22	22 WS	1279	-	-	+415
3760	831	822	-9	9 WS	1422	-	-	+591
3761	310	219	-91	22 WS, 69 RP	277	-	-	-33
3764	148	89	-59	7 WS, 52 RP	148	-	-	-
3768	1440	1374	-66	40 WS, 26 MD	2014	-26	26 MD	+574
3769-0626	40	34	-6	6 RP	40	-	-	-
3770	27	21	-6	6 RP	27	-	-	-
3771	243	236	-7	7 WS	243	-	-	-
3772	188	135	-53	2 WS, 51 RP	188	-	-	-
3773	143	121	-22	22 WS	143	-	-	-
3775	450	448	-2	2 WS	584	-	-	+134
3777	40	36	-4	4 WS	40	-	-	-
3778	808	691	-117	117 WS	1034	-	-	+226
3781	418	307	-111	13 WS, 98 RP	341	-	-	-77
3782	1165	1152	-13	13 WS	1602	-	-	+437

			SHORT TERM			LONG TERM		
GR NUMBER	PREF. AUMs	AUMs	CHANGE + or -	REDUCTION BREAKDOWN	AUMS	CHANGE + or -	REDUCTION BREAKDOWN	CHANGE FROM PREF. AUMs
3783	1107	1042	-65	65 WS	1257	-	-	+150
3784	808	640	-168	168 WS	1261	-	-	+453
3786	28	16	-12	1 WS, 11 RP	28	-	-	-
3787	111	84	-27	27 WS	111	-	-	-
3788	60	35	-25	6 WS, 19 RP	60	-	-	-
3790	388	343	-45	22 WS, 23 RP	403	-	-	+15
3791	1793	1776	-17	17 WS	2172	-	-	+379
3792	154	100	-135	19 WS, 116 RP	154	-	-	-
3793	53	35	-18	5 WS, 13 RP	53	-	-	-
3795	10	8	-2	2 RP	10	-	-	-
3796	131	120	-11	11 WS	131	-	-	-
3797	682	641	-41	41 WS	810	-	-	+128
3798	72	63	-9	5 WS, 4 RP	72	-	-	-
3799	942	905	-37	35 WS, 2 RP	1001	-	-	+59
3800	100	72	-28	14 WS, 14 RP	100	-	-	-
3801	808	736	-72	72 WS	1720	-	-	+912
3802	448	412	-36	36 WS	539	-	-	+91
3803-0526	1016	995	-21	21 WS	1168	-	-	+152
3803-0694	428	419	-9	9 WS	500	-	-	+72
3804	21	18	-3	2 WS, 1 RP	21	-	-	-
3806	260	256	-4	4 WS	260	-	-	-
3807	206	201	-5	5 WS	266	-	-	+60
3809-0492	454	419	-35	35 WS	585	-	-	+131
3809-0532	42	39	-3	3 WS	54	-	-	+12
3811	277	275	-2	2 WS	366	-	-	+89
3812	305	303	-2	2 WS	323	-	-	+18
3813	699	666	-33	33 WS	816	-	-	+117
3814	1466	1201	-265	128 WS,137 RP	1546	-	-	+80
3815	512	477	-35	35 WS	606	-	-	+94
3817	92	69	-23	23 WS	152	-	-	+60
3820	727	646	-81	81 WS	1326	-	-	+599
3822	486	466	-20	20 WS	596	-	-	+110
3823	205	167	-38	18 WS, 20 RP	215	-	-	+10
3824	15	8	-7	2 WS, 5 RP	15	-	-	-
3826	89	67	-22	4 WS, 18 RP	89	-	-	-
3827	441	403	-38	5 WS, 33 RP	420	-	-	-21
3828	83	64	-19	19 RP	83	-	-	-
3834	259	238	-21	7 WS, 14 RP	257	-	-	-2
3835	504	487	-17	17 WS	578	-	-	+74
3836	478	333	-145	38 WS, 107 RP	434	-	-	-44
3837	152	64	-88	16 WS, 72 RP	152	-	-	-
3838	150	120	-30	30 RP	150	-	-	-
3839	523	491	-32	32 WS	733	-	-	+210
3840	1224	1037	-187	54 WS, 14 AW, 119 RP	1129	-14	14 AW	-95
3841	605	563	-42	42 WS	806	-	-	+201
3842	51	16	-35	4 WS, 31 RP	51	-	-	-

		SHORT TERM			LONG TERM			
GR NUMBER	PREF. AUMs	AUMs	CHANGE + or -	REDUCTION BREAKDOWN	AUMS	CHANGE + or -	REDUCTION BREAKDOWN	CHANGE FROM PREF. AUMs
3843	124	121	-3	3 WS	124	-	-	-
3844	521	406	-115	58 WS, 57 RP	561	-	-	+40
3845	1013	793	-220	220 WS	1174	-	-	+161
3846	427	328	-99	25 WS, 74 RP	396	-	-	-31
3847	47	34	-13	9 WS, 4 RP	47	-	-	-
3848-0392	1122	950	-172	142WS,30AW/SG	1223	-30	30 AW, SG	+101
3848-0452	222	195	-27	18 WS, 9 RP	246	-	-	+24
3848-0569	649	545	-104	75WS,29AW/SG	710	-29	29 AW, SG	+61
3849	38	18	-20	2 WS, 18 RP	38	-	-	-
3850	625	565	-60	60 RP	625	-	-	-
3852	991	805	-186	186 WS	1685	-	-	+694
3853	1568	1374	-194	194 WS	2659	-	-	+1091
3854	192	186	-6	6 WS	281	-	-	+89
3855	706	692	-14	14 WS	851	-	-	+145
3856	57	49	-8	5 WS, 3 RP	57	-	-	-
3857	222	184	-38	13 WS, 25 RP	269	-	-	+47
3859	336	297	-39	39 RP	336	-	-	-
3860	251	246	-5	5 WS	331	-	-	+80
3861	11	9	-2	2 RP	11	-	-	-
3862	66	33	-33	7 WS,26MD/WT	40	-26	26 MD, WT	-26
3863	398	395	-3	3 WS	596	-	-	+198
3864	16	10	-6	6 RP	16	-	-	-
3865	959	870	-89	61 WS, 28 BH	1039	-28	28 BH	+80
3867	299	251	-48	48 RP	299	-	-	-
3868	113	77	-36	36 RP	113	-	-	-
3872	10	8	-2	1 WS, 1 RP	10	-	-	-
3873	221	201	-20	20 WS	221	-	-	-
3874	973	941	-32	32 WS	1173	-	-	+200
3875	131	129	-2	2 WS	131	-	-	-
3876	93	36	-57	1 WS, 56 RP	93	-	-	-
3877	83	55	-28	11 WS, 17 RP	83	-	-	-
3878	40	39	-1	1 WS	40	-	-	-
3879	2939	2827	-112	92 WS, 20 PD	3287	-20	20 PD	+348
3880	811	610	-201	26 WS, 175 RP	678	-	-	-133
3882	150	116	-34	24 WS, 10 AW	140	-10	10 AW	-10
3883	438	413	-25	25 WS	653	-	-	+215
3884-0605	27	25	-2	2 WS	27	-	-	-
3884-0606	32	29	-3	3 WS	32	-	-	-
3885	1607	1503	-104	20 WS, 84 RP	1556	-	-	-51
3886	146	138	-8	8 WS	225	-	-	+79
3887	208	207	-1	1 WS	314	-	-	+106
3888	369	287	-82	43 WS, 39 RP	394	-	-	+25
3889	450	344	-106	35 WS, 71 RP	450	-	-	-
3890	318	249	-69	69 WS	565	-	-	+247
3891	53	42	-11	1 WS, 10 RP	53	-	-	-
3892	264	132	-132	38 WS,94MD/WT	253	-94	94 MD, WT	-11
3894	163	117	-46	1 WS, 45 RP	163	-	-	-

GR NUMBER	PREF. AUMs	SHORT TERM AUMs	CHANGE + or -	REDUCTION BREAKDOWN	LONG TERM AUMS	CHANGE + or -	REDUCTION BREAKDOWN	CHANGE FROM PREF. AUMs
3895	39	24	-15	5 WS, 10 RP	39	-	-	-
3896	230	160	-70	5 WS, 65 RP	176	-	-	-54
3897	317	167	-150	12 WS, 138 RP	236	-	-	-81
3898	1515	817	-696	410 WS, 24 WT 262 RP	1082	-24	24 WT	-431
3899	275	155	-120	18 WS, 102 RP	183	-	-	-92
3900	80	54	-16	11 WS, 5 RP	84	-	-	+4
3903	406	302	-104	37 WS, 67 RP	336	-	-	-70
3904	54	53	-1	1 WS	54	-	-	-
3905	422	233	-189	7 WS, 182 RP	254	-	-	-168
3906	497	259	-238	84 WS, 154 RP	345	-	-	-152
3908	500	343	-157	52 WS, 105 RP	394	-	-	-106
3909	165	124	-41	10 WS, 31 RP	150	-	-	-15
3910	621	381	-240	1 WS, 239 RP	413	-	-	-208
3911	395	131	-264	20 WS, 244 RP	190	-	-	-205
3912	992	920	-72	72 WS	1238	-	-	+246
3913	335	174	-161	8 WS, 153 RP	192	-	-	-143
3914	270	115	-155	48 WS, 107 RP	156	-	-	-114
3915	365	144	-221	25 WS, 196 RP	213	-	-	-152
3916	700	651	-49	45 WS, 4 SG	837	-4	4 SG	+137
3917	248	209	-39	1 WS, 38 RP	210	-	-	-38
3918	212	171	-41	5 WS, 36 RP	186	-	-	-26
3919-0656	695	462	-233	102 WS,131 RP	619	-	-	-76
3919-0679	265	185	-80	80 WS	226	-	-	-39
3920	572	407	-165	47 WS, 118 RP	493	-	-	-79
3921	287	204	-83	2 WS, 81 RP	287	-	-	-
3922	502	377	-125	47 WS, 78 RP	470	-	-	-32
3923	767	745	-22	22 WS	1708	-	-	+941
3924	193	186	-7	7 WS	193	-	-	-
3925	4263	3291	-972	4621 WS,96 MD 414 RP	3992	-96	96 MD	-271
3926	2893	2336	-557	217 WS, 13 SG ST, 327 RP	2944	-13	13 SG, ST	+51
3927	933	537	-396	194 WS,202 RP	877	-	-	-56
3928	352	264	-88	22 WS, 66 RP	352	-	-	-
3929	113	83	-28	7 WS,21 RP	113	-	-	-
3930	146	118	-28	28 WS	146	-	-	-
3932	433	428	-5	5 WS	515	-	-	+82
3934	683	516	-167	105 WS, 62 RP	621	-	-	-62
3935	56	41	-15	10 WS, 5 RP	56	-	-	-
3936	532	471	-61	61 WS	970	-	-	+438
3937	2003	1600	-403	98 WS, 305 RP	1870	-	-	-133
3938	116	92	-24	24 RP	116	-	-	-
3939	1339	1232	-107	26 WS, 81 RP	1290	-	-	-49
3942	10	6	-4	1 WS, 3 RP	10	-	-	-
3943	19	17	-2	2 RP	19	-	-	-

			SHORT TERM			LONG TERM		
GR NUMBER	PREF. AUMs	AUMs	CHANGE + or -	REDUCTION BREAKDOWN	AUMS	CHANGE + or -	REDUCTION BREAKDOWN	CHANGE FROM PREF. AUMs
3944-0700	64	59	-5	5 WS	64	-	-	-
3944-0732	14	13	-1	1 WS	14	-	-	-
3945	57	46	-11	11 RP	57	-	-	-
3947	232	221	-11	11 WS	313	-	-	+81
3948	119	70	-49	4 WS, 45 RP	119	-	-	-
3949	144	112	-32	32 WS	197	-	-	+53
3950	93	48	-45	12 WS, 33 RP	93	-	-	-
3951	369	318	-51	51 WS	567	-	-	+198
3952	11	9	-2	2 WS	15	-	-	+4
3957	713	472	-237	124 WS,113 RP	652	-	-	-61
3958	7	5	-2	2 WS	7	-	-	-
3959	398	376	-22	22 WS	676	-	-	+278
3960	181	159	-22	22 WS	181	-	-	-
3961	82	60	-22	22 RP	82	-	-	-
3962	219	170	-49	4 WS, 45 RP	182	-	-	-37
3963	21	11	-10	1 WS, 9 RP	21	-	-	-
3964	138	106	-32	32 RP	138	-	-	-
3965	808	726	-82	70 WS, 12 RP	916	-	-	+108
3966	833	768	-65	65 WS	974	-	-	+141
3968	42	33	-9	2 WS, 7 RP	42	-	-	-
3970	18	15	-3	3 RP	18	-	-	-
3971	19	16	-3	1 WS, 2 RP	19	-	-	-
3972	9	5	-4	4 WS	9	-	-	-
3973	214	201	-13	13 WS	214	-	-	-
3974	11	7	-4	4 RP	11	-	-	-
3976	733	724	-9	9 WS	807	-	-	+74
3977	646	502	-144	30 WS, 12 AW 102 RP	582	-12	12 AW	-64
3978	89	66	-23	9 WS, 14 RP	89	-	-	-
3979	931	480	-451	451 WS	1349	-	-	+418
3980	52	29	-23	7 WS, 16 RP	52	-	-	-
8985	12	5	-7	1 WS, 6 RP	12	-	-	-
8986	1630	1571	-59	59 WS	1884	-	-	+254
Totals		167,274	-30,504	WS 13,855 Wildlife 1566 RP 15,083	222,061	-1566		

APPENDIX I

METHODOLOGY—HYDROLOGY

During the summer of 1982, 29 reservoirs were surveyed for sediment production (Table I-1). Data obtained were used along with the range inventory mentioned in Chapter Three to calculate sediment yields in Chapter Four. No surveys were made to determine watershed condition due to time and expense involved. Areas in poor range condition were assumed to be in poor watershed condition. Areas in fair and good range condition were assumed to be in good watershed condition. Areas in excellent range condition were assumed to be in excellent watershed condition.

The reservoirs were arranged in units according to the geologic parent material of their watersheds. Sediment yields from reservoirs in each unit were arranged in a scale from lowest to highest (Table 3-12). The low end of the scale represents sediment yields from watersheds in excellent condition and the high end of the scale represents watersheds in poor condition.

In each alternative, range condition changed according to the treatments or grazing systems proposed. Watershed condition was assumed to change by the same degree as range condition. For instance, in Alternative C, 876,614 acres were upgraded to excellent range condition. Correspondingly, those 876,614 acres were upgraded to excellent watershed condition also. It was assumed the 876,614 acres comprised the same percentage composition of geologic parent material units as found in the entire Resource Area. Sediment yields from the scale for each unit were then applied to the number of acres undergoing change, to arrive at the figure appearing in Tables 4-1, 4-5, 4-17 and 4-18 and 4-19.

Water yields were obtained from methods described in Omang, Parrett and Hull (1983). The same method for determining water yields was used as in determining sediment yields.

TABLE I-1
RESERVOIR SEDIMENT SURVEY

No.	Reservoir Name	Location	Age (Year)	Drainage Area Acres/Mi^2	Geologic Formation	Soil Series	Percent Composition	Designed Capacity-Ac Ft	Accumulated Sediment-Ac Ft	Sediment Yield Ac Ft/Mi^2/Yr
1	Scraper Reservoir	9N,49E,29 NESE	11	81.9/0.13	Lebo Shale	Abor-Neldore Clays	70	8.53	1.74	1.22
						Delpoint-Yamac-Cabbart	30			
2	Ashby Draw	1S,56E,18 NWNE	13	429.7/0.67	Hell Creek	Kremlin	10	34.52	5.05	0.33
						Busby	50			
						Delpoint-Cabbart	15			
						Busby-Delpoint-Yawdim	10			
						Pring-Sandy Loam	15			
3	Humbolt Pit	3S,58E,19 SWSE	12	24.0/0.04	Pierre Shale	Neldore	100	4.89	2.90	6.04
4	Bullrush Pit	2S,58E,14 SWSE	13	115.5/0.18	Pierre Shale	Arsite Clay (Neldore Clay, Saline)	100	3.26	2.25	0.96
5	Rough Creek Reservoir	9S,47E,12 SWSW	12	120.3/0.19	Tongue River Member	Kirby-Birney	50	4.11	0.68	0.30
						Cabbart-Rentsac	40			
						Cooers	10			
6	Cline Pit	1S,58E,33 SESW	16	81.5/0.13	Pierre Shale	Vanda	85	3.45	2.47	1.19
						Neldore	15			
7	A.J. Reservoir	4N,49E,34 SESE	22	62.5/0.10	Lebo Shale	Delpoint-Cabbart-Yawdim	100	3.80	2.55	1.16
8	Draw Reservoir	9N,49E,28 SWSE	11	54.2/0.08	Lebo Shale	Gerdrum-Creed	80	3.04	0.83	0.94
						Delpoint-Yamac-Cabbart	20			
9	State Reservoir	8S,49E,16 SENE	43	66.0/0.10	Tongue River Member	Yamac-Delpoint	10	11.27	2.48	0.58
						Delpoint-Yamac	35			
						Birney-Kirby-Cooers	50			
						Delpoint-Cabbart-Yawdim	5			
10	Poecheale Reservoir	3S,55E,21 NESW	36	196.5/0.31	Fox Hills	Yamac-Delpoint	80	6.55	2.43	0.22
						Busby FSL	20			
11	Grass Reservoir	3S,55E,32 NESE	17	359.3/0.56	Fox Hills	Twilight-Cambeth	50	7.20	2.13	0.22
						Forelie-Yamac	50			
12	Sagebrush Pit	5S,57E,19 NESW	12	86.1/0.13	Pierre Shale	Pinelli Loam	100	2.62	0.24	0.15
13	Whitetail Pit	5S,57E,14 NWNE	13	104.1/0.16	Pierre Shale	Bascovy	40	2.53	0.81	0.39
						Blackhall-R.O.-	30			
						Neldore	30			
14	Softwater Pit	2S,58E,24 SWNE	21	51.7/0.08	Pierre Shale	Vaeda-Creed	50	4.01	2.33	1.39
						Arsite	50			
15	Rough Reservoir	5S,50E,17 NWSE	18	286.9/0.45	Tongue River Member	Delpoint	45	18.56	18.56	2.29
						Cabbart	35			
						Yawdim	20			
16	HCC-2 Pit	2S,58E,26 SESW	26	191.4/0.3	Pierre Shale	Creed-Absher	30	5.72	3.51	0.45
						Arsite	70			
17	Brown Cattle Co. Reservoir	5S,42E,33 NENE	42	742.7/1.16	Tongue River Member	Yamac	15	6.26	2.64	0.05
						Delpoint-Cabbart-Yawdim	35			
						Yamac-Birney-Cabbart	30			
						Armells-Kirby-Cabbart	20			
18	Lone Tree Pit	6S,61E,7 NWSW	8	183.4/0.29	Pierre Shale	Thebo Clay	100	1.64	1.51	0.65
19	Dean Pit	9S,62E,10 SENW	11	52.7/0.08	Pierre Shale	Yawdim	100	6.53	0.91	1.03
20	Middle Reservoir	9S,61E,34 NESW	27	19.3/0.03	Niobrara Shale	Volborg	100	9.66	1.95	2.41
21	Short Day Reservoir	7S,62E,25 SWNW	24	89.7/0.14	Pierre Shale	Abor Clay	70	4.73	2.21	0.66
						Vaeda	30			
22	Blackfoot Ferret Pit	9S,57E,26 NESW	15	46.8/0.07	Belle Fourche Shale	Neldore-Volborg Clays	100	5.99	3.43	3.27

No.	Reservoir Name	Location	Age (Year)	Drainage Area Acres/Mi^2	Geologic Formation	Soil Series	Percent Composition	Designed Capacity-Ac Ft	Accumulated Sediment-Ac Ft	Sediment Yield Ac Ft/Mi^2/Yr
23	North End Reservoir	6S,58E,27 NESW	19	23.1/0.04	Pierre Shale	Rock Outcrop-Yawdim Saline	100	10.05	2.83	3.72
24	Broken Stove Reservoir	1S,55E,8 NESW	31	138.1/0.22	Hell Creek	Archin	25	8.95	2.09	0.31
						Forelle	50			
						Twilight	15			
						Twilight-Cambeth	10			
25	Jack Rabbit Reservoir	2S,58E,13 SWSE	17	1040/1.63	Pierre Shale	Gerdrum-Absher	30	58.70	13.03	0.47
						Arsite	50			
						Vaeda-Creed	10			
						Neldore-R.O.	10			
26	Mackey Reservoir	3S,53E,11 SESW	23	209.4/0.33	Tullock Member	R.O.	20	3.61	0.17	0.02
						Cabbart-Delpoint	50			
						Delpoint-Yamac	20			
						Havre	10			
27	Red Head Pit	8S,57E,1 NESE	15	211.7/0.33	Carlile Shale	Orinoco-Yawdim	20	3.82	1.04	0.21
						Volborg-R.O.	40			
						Bascovy	20			
28	Schaffer Reservoir	2S,53E,2 NENE	18	55.6/0.09	Tullock Member	Marvan	20	3.84	0.13	0.08
						Delpoint-Yamac	70			
29	Coyote Pit	2S,59E,20 NENW	9	8.5/0.01	Pierre Shale	Cabbart-R.O.	30	3.60	1.20	13.33
						Arsite	100			

APPENDIX J

SELECTED VEGETATION AND RANGE MANAGEMENT CHARACTERISTICS OF THE TEN SOIL SUBGROUPS

Soil Orders and Soil Subgroups	Percent of Public Land (Acres)	Vegetation Type	Key Species	Increaser	Response To Grazing Management	Others
1)Orders-entisols, aridisols, inceptisols mollisols. Subgroups-clayey, loamy, and sandy soils on nearly level to strongly sloping (0-15% slopes on floodplains, fans and low terraces	7% (71,683)	grasslands and deciduous woodlands	western and thickspike wheatgrass, green needlegrass, willows, cottonwood	wild rose, snowberry, cactus, bluegrass	Responds quickly, livestock congregate here	Some soils salt-affected
2)Orders-mollisols, aridisols. Subgroups-loamy and sandy soils on nearly level to steep (0-45%) slopes on fans, benches and terraces	4% (4,130)	grassland/sagebrush	western and thickspike wheatgrass	big sagebrush, fringed sagewort, needle and thread	Moderate to slow	Wind erosion on unprotected surfaces
3)Orders-aridisols, mollisols. Subgroups-loamy soils on nearly level to steep (0-45%) slopes on fans, benches and terraces	% (17,181)	grassland/sagebrush	western and thickspike wheatgrass	big sagebrush, fringed sagewort, needle-and-thread	Moderate to rapid	Wind erosion on unprotected surfaces

Soil Orders and Soil Subgroups	Percent of Public Land (Acres)	Vegetation Type	Key Species	Increaser	Response To Grazing Management	Others
4)Orders-entisols, inceptisols, mollisols. Subgroup-loamy and sandy soils on moderately sloping to steep (8-45%) slope on sedimentary bedrock plains	6% (61,940)	grassland/ ponderosa pine	western wheatgrass, green needlegrass	yucca, blue grama, red three awn, needle-and-thread	Moderate	Shallow soils and steep slopes will limit activities
5)Orders-mollisols, entisols. Subgroups-clayey, loamy and sandy soils on nearly level to strongly sloping (0-15%) slopes on sedimentary bedrock plains and hills.	2% (19,371)	grassland and grassland/ ponderosa pine	western wheatgrass, needle-and-thread	needle and thread, blue grama, club moss, fringe sagewort, cactus	Moderate	Shallow soils will limit activities
6)Orders-entisols, aridisols. Subgroups-clayey, loamy and sandy soils on strongly sloping to steep (8-45%) slopes on dissected sedimentary bedrock plains and hills.	48% (521,532)	grassland or woodland and grassland	bluebunch and western wheatgrass, needle-and-thread, little bluestem	ponderosa pine, blue grama, yucca, juniper	Slow to moderate	Wind erosion on unprotected surfaces

Soil Orders and Soil Subgroups	Percent of Public Land (Acres)	Vegetation Type	Key Species	Increaser	Response To Grazing Management	Others
7)Orders-aridisols, entisols. Subgroups-clayey, loamy and sandy soils on nearly to moderately steep (0-25%) slopes on sedimentary bedrock plains	18% (197,162)	grassland	western wheatgrass, little bluestem	bluegrass, ponderosa pine, annual bromes, blue grama	Slow to rapid	Wind erosion on unprotected surfaces shallow and steep soils will limit activities
8)Orders-entisols, aridisols, vertisols. Subgroups-clayey soils on strongly sloping to steep (8-45%) slopes on dissected shale plains	15% (161,221)	ponderosa pine/ grassland grassland	western and thickspike wheatgrass, green needle grass, prairie sandreed, little bluestem	ponderosa pine, creeping juniper, big sagebrush	Slow to moderate	Wind erosion on unprotected surfaces shallow and steep soils will limit activities
9)Orders-badlands, entisols. Subgroups-clayey, loamy and sandy soils on steep to very steep(25-70%) slopes on highly dissected badlands and river breaks	.6% (6,271)	juniper/grassland and ponderosa pine/ grassland	bluebunch and western wheatgrass	blue grama, yucca, annuals, weedy forbs, broom snakeweed	Very slow	Shallow and steep soils will limit activities

Soil Orders and Soil Subgroups	Percent of Public Land (Acres)	Vegetation Type	Key Species	Increaser	Response To Grazing Management	Others
10)Order-aridisols, mollisols entisols. Subgroups-predominantly clayey, nearly level to strongly sloping (0-15%) slopes on low terraces, fans and floodplains	2% (20,184)	grassland/ woody riparian	buffalo berry rose, willow, Russian olive, ash, box elder, cottonwood western wheatgrass, needle and thread	rose, willow, russian olive, western wheatgrass	Moderate to slow	Salt-affected

APPENDIX K

*POSSIBLE LAND TREATMENTS BY RANGE SITES

Range Sites	Soil Series by Range Site	Chiseling at 4-6 inch depth	Contour Scalping at 2-4 inch depth	Contour Furrowing at 4-10 inch depth	Seedbed Preparation and seeding slopes <12%	Ripping at 10-20 inch depth	Burning dense Big Sagebrush (<30% cover)	Fertilizing (Reestablishing areas and encouraging better livestock distribution)	Chemical dense Big Sagebrush (<30% cover)
1. Overflow (OV) 0-2% slope	Cherry, Fluvaquents, Glendive, Hanley, Harlem, Haverson, Havre, Lohmiller, McKenzie, Rivra, Ryell, Torrifluvents, Trembles	Harlem Havre Haverson Lohmiller	Harlem Havre	None	Cherry Glendive Havre Lohmiller	Harlem Haverson Havre	Not recommended burning causes undue erosion	None	None
2. Sandy (Sy) 0-15% slope	Assiniboine, Bankard, Banks, Busby, Chanta, Chinook, Cozberg, Glendive, Lihen, Lisk, Nelson, Parshall, Pring, Remmit, Spang, Tally, Terry, Tullock, Twilight, Vona, Yetull	Chanta Degrand	None	None	Busby Chinook Degrand Glendive Parshall Tally	None	Not recommended	Most soils are adequate	None
3. Silty (Si) 0-15% slope	Alona, Alzada, Arnegard, Attewan, Bonfri, Broadus, Bryant, Chanta, Cherry, Colby, Cooers, Creed, Cambeth, Cambert, Cushman, Degrand, Delpoint, Ethridge, Evanston, Farland, Farnuf, Fergus, Floweree, Forelle, Fort Collins, Hopley, Hydro, Hysham, Kremlin, Labre, Lonna, Marmarth, McRae, Patent, Pinelli, Rapelje, Reeder, Relan, Rominell, Savage, Shambo, Spearman, Spinekop, Thedalund, Vanstel, Wanetta, Yamac, Zahill, Zahl	Cherry Ethridge Evanston Forelle Pinelli	Arnegard Attewan Chanta Cherry Cambeth Cambert Degrand Delpoint Ethridge Evanston Floweree Forelle Kremlin Lonna Pinelli Yamac Zahill	None	Arnegard Attewan Bonfri Cambert Cherry Creed Degrand Ethridge Evanston Farland Farnuf Floweree Forelle Kremlin Lonna Marmarth Pinelli Reeder Savage Shambo Yamac	None	Most soils are adequate	Most soils are adequate	Most soils are adequate
4. Clayey (Cy) 0-15% slope	Alona, Allentine, Abor, Bascovy, Belfield, Bew, Bickerdyke, Boettcher, Chugter, Ethridge, Fergus, Galata, Harlem, Havre, Hesper, Heldt, Hydro, Keiser, Kobar, Kyle, Lohmiller, Lonna, Macar, Marias, Marvan, Mosby, Nunn, Orinoco, Pendroy, Pierre, Regent, Renohill, Sagedale, Savage, Teigen, Thurlow, Vananda	Abor Ethridge Kobar Lonna	Abor Ethridge Kobar Lonna	None	Abor Kobar Lonna Regent	Selective soils may be ripped	Most soils are adequate	Most soils are adequate	Most soils are adequate
5. Claypan (Cp) 0-15% slope	Absher, Archin, Arvada, Creed, Gerdrum, Hopsonville, Hoven, Parchin, Weingart, Winnett	Creed Gerdrum Haven Parchin	None	Absher Gerdrum Hoven	Creed Gerdrum	None	Vegetation is not dense enough to carry a fire	None	None
6. Dense Clay (DC) 0-8% slope	Absher, Bone, Giltedge, Marias, Vanda, Vaeda	Marias	None	Absher	Marias	None	Vegetation is not dense enough to carry a fire	None	None

*Based on 1983 BLM State Guide to Treatment Selection by Dominant Range Site.

APPENDIX L

DATA SOURCES FOR WILDLIFE OVERLAYS

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Powder River Resource Area MFPs

Powder River Resource Area URAs

Prairie Dog Landowner Questionnaire

Prairie Dog Survey

Raptor Nest Files

SVIM Data

Western Energy Company 1977. Mine Plan Application for the Rosebud Mine, Area A.

APPENDIX M WILDERNESS

TABLE I

STATEWIDE WILDERNESS STATUS SUMMARY

A. Status of BLM Areas Under Study

				Study Start and Completion Dates		
County	BLM District	Unit Number	Total Acreage	Start	Completion	Status
Madison	Butte	MT-076-063	860	1981	1983	Part of USFS Planning EIS
Madison	Butte	MT-076-079	1,469	1980	1980	Completed USFS Draft
Powell	Butte	MT-074-150	11,580	1982	1985	URA 2 Complete
Powell	Butte	MT-074-151a	11,380	1982	1985	URA 2 Complete
Powell	Butte	MT-074-151b	4,257	1982	1985	URA 2 Complete
Granite	Butte	MT-074-155	520	1982	1985	URA 2 Complete
Valley	Lewistown	MT-064-356	59,112	1983	1984	URA 2 Complete
Rosebud	Miles City	MT-027-701	8,438	1981	1984	MFP 2 Complete
Powder River	Miles City	MT-027-702	5,650	1981	1984	MFP 2 Complete

B. Recommendations Transmitted by this Report

						Recommendations	
District	Resource Area	Plan Name	Unit Number	Unit Name	Total Acreage	Acres Suitable	Acres Nonsuitable
Miles City	Powder River	Powder River RMP	MT-027-701	Zook Creek	8,438	0	8,438
			MT-027-702	Buffalo Creek	5,650	0	5,650

C. Completed BLM Studies -- A

District	Resource Area	Plan Name	Unit Number	Unit Name	Total Acreage	SD's Preliminary Recommendations
Butte	Dillon	Wilderness Planning Amendment/EIS for the Dillon RA	MT-076-001	Ruby Mountains	26,611	15,615 ac. suitable 10,996 ac. nonsuitable
Butte	Dillon	Wilderness Planning Amendment/EIS for the Dillon RA	MT-076-002	Blacktail Mtns.	17,479	10,986 ac. suitable 6,493 ac. nonsuitable
Butte	Dillon	Wilderness Planning Amendment/EIS for the Dillon RA	MT-076-007	E. Fork Blacktail Deer Creek	6,230	6,230 ac. nonsuitable
Butte	Dillon	Wilderness Planning Amendment/EIS for the Dillon RA	MT-076-022	Hidden Past Creek	15,509	15,509 ac. nonsuitable
Butte	Dillon	Wilderness Planning Amendment/EIS for the Dillon RA	MT-076-026	Bell/Limekiln Canyons	9,650	9,650 ac. nonsuitable
Butte	Dillon	Wilderness Planning Amendment/EIS for the Dillon RA	MT-076-028	Henneberry Ridge	9,806	9,806 ac. nonsuitable
Butte	Dillon	Wilderness Planning Amendment/EIS for the Dillon RA	MT-076-069	Axolotl Lake	7,804	7,804 ac. nonsuitable

District	Resource Area	Plan Name	Unit Number	Unit Name	Total Acreage	SD's Preliminary Recommendations
Butte	Headwaters	Headwater RMP	MT-075-102	Blind Horse Creek	4,927	0 ac. suitable 4,927 ac. nonsuitable
Butte	Headwaters	Headwater RMP	MT-075-105	Chute Mountain	3,086	0 ac. suitable 3,085 ac. nonsuitable
Butte	Headwaters	Headwater RMP	MT-075-106	Deep Creek/ Battle Creek	3,086	0 ac. suitable 3,086 ac. nonsuitable
Butte	Headwaters	Headwater RMP	MT-075-115	Black Sage	5,976	0 ac. suitable 5,976 ac. nonsuitable
Butte	Headwaters	Headwater RMP	MT-075-133	Yellowstone River Island	53	0 ac. suitable 53 ac. nonsuitable
Lewistown	Phillips	Missouri Breaks Wilderness Suitability Study/EIS	MT-066-256	Cow Creek	34,050	21,590 ac. suitable 12,460 ac. nonsuitable
Lewistown	Phillips	Missouri Breaks Wilderness Suitability Study/EIS	MT-066-266	Antelope Creek	12,350	9,600 ac. suitable 2,750 ac. nonsuitable
Lewistown	Valley	Missouri Breaks Wilderness Suitability Study/EIS	MT-065-278	Burnt Lodge	13,850	13,850 ac. suitable
Miles City	Big Dry	Missouri Breaks Wilderness Suitability Study/EIS	MT-024-657	Seven Blackfoot	20,250	5,710 ac. suitable 14,540 ac. nonsuitable
Miles City	Big Dry	Missouri Breaks Wilderness Suitability Study/EIS	MT-024-684	Terry Badlands	43,450	29,020 ac. suitable 14,430 ac. nonsuitable
Lewistown	Judith	Missouri Breaks Wilderness Suitability Study/EIS	MT-068-244	Dog Creek South	5,150	5,150 ac. nonsuitable
Lewistown	Judith	Missouri Breaks Wilderness Suitability Study/EIS	MT-068-246	Woodhawk	8,000	8,100 ac. nonsuitable
Lewistown	Havre	Missouri Breaks Wilderness Suitability Study/EIS	MT-066-250	Stafford	4,800	4,800 ac. nonsuitable
Lewistown	Havre	Missouri Breaks Wilderness Suitability Study/EIS	MT-066-253	Ervin Ridge	10,200	10,200 ac. nonsuitable
Miles City	Big Dry	Missouri Breaks Wilderness Suitability Study/EIS	MT-024-675	Bridge Coulee	5,900	5,900 ac. nonsuitable
Miles City	Big Dry	Missouri Breaks Wilderness Suitability Study/EIS	MT-024-677	Musselshell Breaks	8,650	8,650 ac. nonsuitable
Miles City	Big Dry	Missouri Breaks Wilderness Suitabiility Study/EIS	MT-024-633	Billy Creek	3,450	3,450 ac. nonsuitable

District	Resource Area	Plan Name	Unit Number	Unit Name	Total Acreage	SD's Preliminary Recommendations
Miles City	Billings	Billings RMP	MT-067-205	Burnt Timber Canyon	3,955	3,430 ac. suitable 525 ac. nonsuitable
Miles City	Billings	Billings RMP	MT-067-206	Pryor Mountain	16,927	16,927 ac. suitable 0 ac. nonsuitable
Miles City	Billings	Billings RMP	MT-067-207	Big Horn Tack-on	4,550	2,550 ac. suitable 2,000 ac. nonsuitable
Miles City	Billings	Billings RMP	MT-067-212	Twin Coulee	6,870	0 ac. suitable 6,870 ac. nonsuitable

D. Statutory Wilderness (all agencies)

Agency	County(s)	Unit Name & Number	Unit Acreage
BLM	N/A	N/A	0

Agency	County(s)	Unit Name & Number	Unit Acreage
USFS	Carbon, Stillwater, Sweet Grass, Park	Absaroka-Beartooth, NF 106	920,377
USFS	Granite, Ravalli, Deer Lodge, Beaverhead	Anaconda-Pintlar, NF 003	157,874
USFS	Flathead, Teton, Lewis & Clark, Powell	Bob Marshall, NF 005	1,009,356
USFS	Lincoln, Sanders	Cabinets, NF 010	94,272
USFS	Lewis & Clark	Gates of the Mountains, NF 027	28,562
USFS	Flathead Lake	Great Bear, NF 107	286,700
USFS	Missoula	Mission Mountains, NF 050	73,877
USFS	Missoula	Rattlesnake, 1-801	20,000
USFS	Lewis & Clark, Powell	Scapegoat, NF 073	239,296
USFS	Ravalli	Selway-Bitterroot, NF 074	248,893
USFS	Granite	Welcome Creek, NF 103	28,135
	TOTAL USFS	Number of Areas 11	3,107,342

Agency	County(s)	Unit Name & Number	Unit Acreage
USFWS	Beaverhead	Red Rock Lakes, WR-036	32,350
USFWS	Sheridan	Medicine Lake National Wildlife Refuge, WR-027	11,800
USFWS	Phillips	UL Bend National Wildlife Refuge, WR-047	20,847
	TOTAL USFWS	Number of Areas 3	64,997

Agency	County(s)	Unit Name & Number	Unit Acreage
NPS	N/A	N/A	0

Agency	County(s)	Unit Name & Number	Unit Acreage
State Administered	N/A	N/A	0

E. Recommendations Pending Before Congress (all agencies)

Agency	County(s)	Unit Name	Unit Number	Unit Acreage*
USFS	Lincoln	Cabinet Face West	C 1670	8,250
USFS	Sanders, Lincoln	Scotchman Peaks	A & B 1662	60,416
USFS	Sanders	Cabinet Mtn. Addition	C 1681	442
USFS	Sanders	Chippewa Creek (Cabinet Mountain Addition)	1682	382
USFS	Sanders	McKay Creek	B 1676	6,510
USFS	Ravalli	Schley Mountain (Great Burn)	D 1301	12,600
USFS	Ravalli	Hoodoo (Great Burn)	Q 1301	65,097
USFS	Ravalli	Blodgett Canyon	1061	9,600
USFS	Ravalli	N. Fork, Lost Horse	1062	8,598
USFS	Ravalli	Trapper Creek	1063	2,867
USFS	Ravalli	Nelson Lake	1064	3,233
USFS	Ravalli	Meadow Creek	M 1845	12,600
USFS	Ravalli	Swift Creek	1065	700
USFS	Ravalli	Needle Creek	1066	1,175
USFS	Ravalli	Selway-Bitterroot Addn.	S IBB	12,700
USFS	Beaverhead	North Big Hole	B 1001	7,027
USFS	Deer Lodge	Storm Lake	1427	6,065
USFS	Granite	Quigg (Slide Rock)	Q 1807	60,050
USFS	Beaverhead	West Big Hole	I 1943	56,462
USFS	Beaverhead	East Pioneer (Torey Pk.)	1008	87,746
USFS	Madison, Gallatin	Lionhead	1963	20,899
USFS	Madison, Gallatin	Spanish Peaks	NF 920	63,300
USFS	Park	Republic Mountain (N. Absaroka Addition)	1545	480
USFS	Park	Reef (N. Absaroka Addition)	1914	427
USFS	Carbon	Lost Water	1362	9,500
USFS	Rosebud	Tongue River	1373	16,600
USFS	Missoula, Powell	Great Bear-Bob Marshall Scapegoat-Swan	B 1485	3,825
USFS	Powell, Lewis & Clark	Clearwater-Monture	Q 1485	65,385
USFS	Lewis & Clark	Park Bridge	U 1485	3,255
USFS	Lewis & Clark	Renshaw	W 1485	25,649
USFS	Lewis & Clark	Leavitt Creek	T 1485	2,400
USFS	Lewis & Clark	Silverking Falls Creek	F 1485	38,300
USFS	Lewis & Clark	Big Log	W 1610	9,272
	(TOTAL USFS)	(Number of Areas 33)		(681,812)
USFWS	Garfield	East Seven Blackfoot	FW 923-1	12,184
USFWS	Phillips	Mickey Butte	FW 923-2	17,413
USFWS	Phillips, Valley	Burnt Lodge	FW 923-3	22,976
USFWS	Garfield	Billy Creek	FW 923-4	11,556
USFWS	Garfield	West Seven Blackfoot	FW 923-5	7,096
USFWS	Phillips	Antelope Creek	FW 923-6	5,382
USFWS	Garfield	West Hill Creek	FW 923-7	11,896
USFWS	Petroleum	Fort Musselshell	FW 923-8	8,303
USFWS	Garfield	Sheep Creek	FW 923-9	12,424
USFWS	Phillips	West Beauchamp	FW 923-10	6,736
USFWS	Garfield	Wagon Coulee	FW 923-11	10,528

Agency	County(s)	Unit Name	Unit Number	Unit Acreage*
USFWS	Petroleum	Alkali Creek	FW 923-12	6,592
USFWS	Petroleum	Crooked Creek	FW 923-13	6,842
USFWS	Garfield	East Hell Creek	FW 923-14	15,984
USFWS	Garfield	East Beauchamp	FW 923-15	5,568
	(TOTAL USFWS)	(Number of Areas 15)		(161,480)
NPS	Flathead, Glacier	Glacier	NP-915	917,600
NPS	Park, Gallatin	Yellowstone	NP-928	167,060
	(TOTAL NPS)	(Number of Areas 2)		(1,084,660)

* All acreages approximate

F. Other Agency Areas Under Study

Agency	County(s)	Unit Name	Unit Number	Unit Acreage*
USFS	Lincoln	Ten Lakes	1683	33,885
USFS	Lincoln	Mt. Henry	1666	21,000
USFS	Ravalli	Blue Joint Mt.	A 1941	61,400
USFS	Granite, Powell	Flint Range	1428	52,220
USFS	Granite, Powell	Dolus Lake	1429	9,100
USFS	Granite, Ravalli	Sapphires	1421	98,815
USFS	Teton	Deep Creek	P 1485	26,068
USFS	Teton	Reservoir North	H 1485	1,520
USFS	Beaverhead	West Pioneer	1006	147,992
USFS	Madison	Middle Mtn.-Tobacco Roots	B 1013	36,640
USFS	Jefferson, Broadwater	Bullock Hill	A 1620	59,980
USFS	Jefferson, Broadwater	Casey Peak	E 1620	25,000
USFS	Madison, Gallatin	Madison	N 1549	80,057
USFS	Gallatin	Madison	E 1549	105,760
USFS	Madison, Gallatin	Madison S.	S 1549	77,559
USFS	Madison, Gallatin	Madison	R 1549	32,640
USFS	Gallatin, Park	Gallatin Divide	G 1548	81,582
USFS	Gallatin, Park	Hyalite	H 1548	22,268
USFS	Beaverhead	Mt. Jefferson	1962	4,600
USFS	Fergus, Golden Valley	Big Snowies	A,B,S 1739	95,861
USFS	Meagher, Judith Basin	Middle Fork Judith	1734	91,000
USFS	Beaverhead	Italian Peak	I 1945	12,996
USFS	Madison	Madison	J 1549	29,826
	(TOTAL USFS)	(Number of Areas 25)		(1,207,769)
NPS	Big Horn	Big Horn Canyon	-	(7,645)
	(TOTAL NPS)	(Number of Areas 1)		7,645

* All acreages approximate

TABLE II

STATE ECOSYSTEM/LANDFORM REPRESENTATION (MONTANA)

A. Ecosystem/Landform		Existing Representations in Statutory Wilderness										
		BLM Acres		Other Agency Areas*			BLM Areas-Other States			Other Agency Areas*		
No.	Name	No. Acres	Acreage	Agency	No.	Acreage	State	No.	Acreage	State	No.	Acreage
3110 - 15	Great Plains Short grass Prairie, Eastern Ponderosa Pine	None			None			None			None	
	TOTALS											

B. Ecosystem/Landform		Representations in Wilderness Endorsed by President - Pending Before Congress										
		BLM Acres		Other Agency Areas*			BLM Areas-Other States			Other Agency Areas*		
No.	Name	No. Acres	Acreage	Agency	No.	Acreage	State	No.	Acreage	State	No.	Acreage
3110 - 15	Great Plains Short grass Prairie, Eastern Ponderosa Pine	None		USFS	1	16,600		None			None	
	TOTALS											

C. Ecosystem/Landform		Potential Sources of Representations						
		BLM WSA's			Other Agency WSA's			
No.	Name	District	No.	Acreage	Agency	Region, Park, Refuge	No.	Acreage
3110 - 15	Great Plains Short grass Prairie, Eastern Ponderosa Pine	Miles City Miles City	2	14,088	None		None	

* Includes areas administered by the State as Wilderness

TABLE III

MASTER LIST — ECOSYSTEM/LANDFORM REPRESENTATION (U.S.A.)

A. Ecosystem/Landform		Existing Representatives in Statutory Wilderness							
		BLM Areas				Other Agency Areas*			
No.	Name	State	District	No.	Acreage	State	Agency	No.	Acreage
3110 - 15	Great Plains Short grass Prairie, Eastern Ponderosa Pine			None				None	

B. Ecosystem/Landform		Representatives in Wilderness Endorsed by President - Pending Before Congress							
		BLM Areas				Other Agency Areas*			
No.	Name	State	District	No.	Acreage	State	Agency	No.	Acreage
3110 - 15	Great Plains Short grass Prairie, Eastern Ponderosa Pine			None		Montana	USFS	1	16,600

C. Ecosystem/Landform		Location of BLM WSA's with Potential Representations			
No.	Name	State	District	Number of Areas	Acreage
3110 - 15	Great Plains Short grass Prairie, Eastern Ponderosa Pine	Montana	Miles City	2	14,088

D. Ecosystem/Landform		Location of Other Agency Study Areas with Potential Representations*			
No.	Name	State	District	Number of Areas	Acreage
3110 - 15	Great Plains Short grass Prairie, Eastern Ponderosa Pine			None	0

* Includes areas administered by the State as Wilderness

APPENDIX N

METHODOLOGY FOR ASSESSING RANCH RELATED ECONOMIC IMPACTS

This appendix describes the methodology utilized for analyzing the effects of increases or decreases in grazing on ranch income and preferred values in the RMP area.

The first step in the process involved matching each affected allotment in the EIS study area with the respective ranch operation. Some ranch operations have only one BLM grazing allotment, others have two allotments. There is a total of 273 individual ranch operations with BLM grazing privileges in the analysis. Through the use of BLM grazing records and personal knowledge of Powder River employees, the 273 ranches were placed in four size categories (Table 3-28). The predominant type of ranch is a cow/calf operation. Many of the operations also produce cash crops, primarily wheat and barley.

Size categories were developed by determining the amount of acreage required to support the maximum number of cows for each category. For example, for the 0-100 size herd, 100 times 12 months times the average acreage to support one AUM on BLM land (5.19 acres) = 6,228. This figure was rounded to 6,250 acres.

All ranches with less than 6,250 acres were put in this category. The percentage of BLM lands that contributed to the total acreage were computed to determine dependency. See Table 3-29.

The number of active AUMs were then computed to determine the average number of BLM AUMs per ranch.

The number of livestock on ranches within each size category was averaged. Results of averaging indicate the following: 0-100 cows average 60 cows; 101-250 cows average 170 cows; 251-500 cows average 350 cows; 500 plus cows average 900 cows. Ranch budgets were constructed for each of the four average size ranches.

The Economics and Statistics Service (USDA, ESS) developed the representative budgets, using in part, budget data gathered in a national cost of production study in 1979. Tables N-1 through N-4 summarize the representative livestock budgets.

It was assumed that the most likely response of ranchers to changes in BLM AUMs would be to adjust the size of the ranch operation. It is, of course, very difficult to project how individual ranchers would adjust their operations given a change in BLM AUMs. Each ranch operation is unique, and the adjustment by each rancher to a change in BLM AUMs would probably vary somewhat. Small operation ranchers would probably be less likely to reduce the size of their operations and would probably attempt to lease other grazing, for example, to compensate for the loss of BLM grazing. If BLM increased the number of AUMs, ranchers would not necessarily increase the size of their cow/calf operations. They might extend their grazing season, for example.

Ranchers, BLM appraisers and the Federal Land Bank estimate that an average value for BLM grazing permits in the intensive study area is approximately $100 per AUM. For those ranchers who have purchased ranches which include BLM grazing preference at $100 per BLM AUM ($1,200 per AU), it is possible to calculate the price they are paying for BLM AUMs. Using an opportunity cost of capital of 9.3%, the cost of owning the BLM preference is $9.30 per AUM. Adding the 1983 grazing fee of $1.40 results in a total price per AUM of $10.70.

The economic analysis uses average livestock prices for 1977, 1978 and 1979. Cost figures are for 1979. Historically, livestock prices have changed dramatically every three to five years, whereas production costs have risen consistently.

TABLE N-1

Representative Ranch Budget 0-100 Cows

	Unit	Number	Average Weight	Price/ Cwt	Total Value
Sales:					
Steer Calves	Head	24	450	71.23	7,693
Heifer Calves	Head	15	410	62.82	3,863
Feeder Steers	Head	3	725	59.02	1,284
Cull Cows	Head	11	1,000	36.99	4,069
Total					16,909
Total/Cow					281.82

	Total Value	Value/ Head
Cash Costs:		
BLM Permit	301	5.02
State Lease	30	.50
Private Lease	648	10.80
Grazing Association	90	1.50
Hay (Prod)	2,944	49.07
Hay (Purch)	539	8.98
Barley (Prod)	94	1.57
Protein Supp.	173	2.88
Salt & Minerals	160	2.66
Vet. & Medicine	317	5.29
Trucking	98	1.64
Marketing	266	4.44
Hired Labor	149	2.49
Machine Fuel & Labor	855	14.25
Machine Repair	880	14.67
Equipment Fuel & Lube	146	2.44
Equipment Repair	185	3.09
Land Tax	499	8.31
Other Tax	108	1.80
Insurance	94	1.56
General Farm Overhead	491	8.18
Interest on Oper. Capital	422	7.03
Total	9,489	158.15
Other Costs:		
Family Labor	2,341	39.02
Depreciation	1,784	29.73
Interest on Investment other than Land	3,755	62.58
Interest on Land Investment	10,091	168.18
Total	17,971	299.51
Total all Costs	27,460	457.66
Return above Cash Costs	7,420	123.67
Return above Cash Costs & Family Labor	5,079	84.65
Return to Total Investment	3,295	54.92
Return to Land Investment	-460	-7.67

Production Assumptions: Herd size 60 cows; 95% calf crop; 5% calf death loss to weaning; 25 cows per bull; 20% replacement rate; 2% cow loss.

Source: ESS,1980

TABLE N-2

Representative Ranch Budget			101-249 Cows		
	Unit	Number	Average Weight	Price/ Cwt	Total Value
Sales:					
Steer Calves	Head	69	450	71.23	22,117
Heifer Calves	Head	43	410	62.82	11,075
Feeder Steers	Head	8	725	59.02	3,423
Cull Cows	Head	31	1,000	36.99	11,467
Total					48,082
Total/Cow					282.84

	Total Value	Value/ Head
Cash Costs:		
BLM Permit	722	4.25
State Lease	39	.23
Private Lease	1,422	8.37
Grazing Assoc.	248	1.46
Hay (Prod)	8,384	49.32
Hay (Purch)	1,576	9.27
Barley (Prod)	266	1.57
Protein Suppl	490	2.88
Salt & Minerals	451	2.65
Vet. & Medicine	903	5.31
Trucking	332	1.95
Marketing	697	4.10
Hired Labor	746	4.39
Machine Fuel & Lube	1,513	8.90
Machine Repair	1,338	7.87
Equipment Fuel & Lube	253	1.49
Equipment Repair	502	2.95
Land Tax	1,464	8.61
Other Tax	262	1.54
Insurance	723	4.25
General Farm Overhead	1,255	7.38
Interest on Oper. Capital	1,262	7.42
Total	24,848	146.17
Other Costs:		
Family Labor	5,464	32.14
Depreciation	4,667	27.45
Interest on Investment other than land	10,311	60.65
Interest on Land Investment	34,005	200.03
Total	54,447	320.27
Total all Costs	79,295	466.44
Return above Cash Costs	23,234	136.67
Return above Cash Costs & Family Labor	17,770	104.53
Return to Total Investment	13,103	77.08
Return to Land Investment	2,792	16.42

Production Assumptions - herd size 170 cows; 95% calf crop; 5% calf death loss to weaning; 25 cows per bull; 20% replacement rate; 2% cow loss.

Source ESS, 1980

TABLE N-3

Representative Ranch Budget 250-499 Cows

	Unit	Number	Average Weight	Price/ Cwt	Total Value
Sales:					
Steer Calves	Head	142	450	71.23	45,516
Heifer Calves	Head	88	410	62.82	22,666
Feeder Steers	Head	16	725	59.02	6,846
Cull Cows	Head	63	1,000	36.99	23,304
Total					98,332
Total/Cow					280

	Total Value	Value/ Head
Cash Costs:		
BLM Permit	1,856	5.30
State Lease	222	.63
Private Lease	819	2.34
Grazing Assoc.	510	1.46
Hay (Prod)	17,450	49.86
Hay (Purch)	3,203	9.15
Barley (Prod)	545	1.56
Protein Supp.	1,009	2.88
Salt & Minerals	945	2.70
Vet. & Medicine	1,676	4.79
Trucking	473	1.35
Marketing	592	1.69
Hired Labor	3,262	9.32
Machine Fuel & Lube	2,331	6.66
Machine Repair	2,335	6.67
Equipment Fuel & Lube	585	1.67
Equipment Repair	1,047	2.99
Land Tax	2,919	8.34
Other Tax	473	1.35
Insurance	1,470	4.20
General Farm Overhead	2,342	6.69
Interest on Oper. Capital	2,465	7.04
Total	48,529	138.65
Other Costs:		
Family Labor	12,000	34.29
Depreciation	9,027	25.79
Interest on Investment other than land	20,910	59.74
Interest on Land Investment	69,034	197.24
Total	110,971	317.06
Total all Costs	159,500	455.71
Return above Cash Costs	49,803	142.29
Return above Cash Costs & Family Labor	37,803	108.01
Return to Total Investment	28,776	82.22
Return to Land Investment	7,866	22.47

Production Assumptions - herd size 350 cows; 95% Calf Crop; 5% calf death loss; 20 cows per bull; 20% replacement rate; 2% cow loss.

Source: ESS, 1980

TABLE N-4

	Unit	Number	Average Weight	Price/ Cwt	Total Value
Sales:					
Steer Calves	Head	365	450	71.23	116,995
Heifer Calves	Head	226	410	62.82	58,209
Feeder Steers	Head	41	725	59.02	17,544
Cull Cows	Head	162	1,000	36.99	59,924
Total					252,672
Total/Cow					280.75

	Total Value	Value/ Head
Cash Costs:		
BLM Permit	3,727	4.14
State Lease	202	.22
Private Lease	1,278	1.42
Grazing Association	1,305	1.45
Hay (Prod)	44,774	49.75
Hay (Purch)	8,239	9.15
Barley (Prod)	1,410	1.57
Protein Supp.	2,595	2.88
Salt & Minerals	2,430	2.70
Vet. & Medicine	4,311	4.79
Trucking	1,215	1.35
Marketing	1,521	1.69
Hired Labor	8,388	9.32
Machine Fuel & Lube	5,994	6.66
Machine Repair	6,003	6.67
Equipment Fuel & Lube	1,503	1.67
Equipment Repair	2,691	2.99
Land Tax	7,506	8.34
Other Tax	1,215	1.35
Insurance	3,780	4.20
General Farm Overhead	6,021	6.69
Interest on Oper. Capital	6,212	6.90
Total	122,320	135.91
Other Costs		
Family Labor	17,028	18.92
Depreciation	23,211	25.79
Interest on Investment other than Land	53,784	59.76
Interest on Land Investment	208,008	231.12
Total	302,031	335.59
Total all Costs	424,351	471.50
Return above Cash Costs	130,352	144.84
Return above Cash Costs & Family Labor	113,324	125.92
Return to Total Investment	90,113	100.13
Return to Land Investment	36,329	40.37

Production Assumptions - Herd size 900 cows; 95% calf crop; 5% calf death loss to weaning; 20 cows per bull; 20% replacement rate; 2% cow loss.

Source: ESS, 1980

APPENDIX O

METHODOLOGY FOR DETERMINING POPULATION IMPACTS

A review of the number of coal mine workers employed in the three-county region (1,401) divided by the approximate tonnage mined that year (30 MM/Ton) shows that approximately 46 miners are required per million tons of coal mined. See Table O-1.

When a new mine is developed, many local workers go to work at the mine. They may not have been looking for work or they may work more than one job such as ranching and working at the mine.

Review of employment figures for the Decker and Big Sky mines show that 40% of the work force of miners had been living in the area before development. It also showed that 85% were married and had their families with them. The review also showed that miners desire single family housing.

Service workers for small businesses in the community grow slowly at the beginning of construction. This is due to an increase in productivity of the workers presently employed. For example, the presently employed waitresses in a restaurant can provide service to many more customers than presently served before an additional waitress is required. This would be true of office workers, store clerks, service station attendants, etc. Therefore, growth in the service sector is slow to react.

As the demand for service workers increases, past experience has shown that many family members of the local population enter the work force. These are people that were not counted in the unemployment figures for the area.

Many of the family of in-migrants to the operational work forces will also fill many of the openings that develop in the service sector.

As the mine is developed, it will draw in-migrants looking for work. If they cannot go to work at the mine, they will fill jobs in the service sector.

Using this past experience and assumptions, the following computations were made to determine the estimated numbers of additional people that will come into an area for each million tons of coal that is planned to be mined.

TABLE O-1
REQUIREMENTS FOR ONE MILLION TONS OF COAL MINED PER YEAR

Miners		46	
Secondary workers (construction and services)		45	
	Total	91	
Miners required per MM/Ton		46	
Local workers 40% estimate		18	
In-migration required		28	
		Population Increase	Housing Units Required[2]
In-migrants:			
85% with families (24) x 2.8		67	24
15% single or without families		4	4
	Total	71	28
Secondary workers estimate		45	
50% local		22	
In-migrants required		23	
		Population Increase	Housing Units Required[2]
In-migrants:			
60% with families (14) x 2.8		39	14
40% single or without families (9)		9	9
	Total	48	23
Population increase		119 per million tons per year	
Housing requirements		51 per million tons per year	

[1] Projected secondary employment is estimated at one additional job for each additional permanent job in energy. Source: Draft EIS, Round II Coal Lease Sale, Powder River Region, Casper District, BLM, January 1984.

[2] Housing unit requirements are computed using family size of married in-migrants into population increase and a single unit for each single in-migrant.

APPENDIX P

OIL AND GAS LEASING PROGRAM IMPACT SUMMARY

Proposed Action

The following summary presents the impacts considered most significant within each environmental component as a result of the Resource Area's oil and gas leasing program (proposed action) as summarized in the Management Guidance Common to All Alternatives section in Chapter 2 of this RMP. The reader may refer to the environmental impact assessment in Chapter 2 of the Miles City District Oil and Gas EA for a detailed analysis. That document is on file at the Miles City District Office.

Geology

Impacts could occur on paleontological features within the study area resulting from the full range of surface disturbing actions associated with oil and gas activities.

Soils

Impacts would result in certain areas depending upon slope, rainfall, inherent soil characteristics, and vegetative cover. Soil productivity would be lessened from compaction, use of inferior fill material and spillage of fuel, drilling fluids, and crude oil.

Topography

No significant impacts are expected.

Vegetation

Impacts would result from the direct destruction of plant cover from all phases of oil and gas activities. The area-specific magnitude of impacts depends upon slope, climatic conditions, soils, and vegetative types involved.

Water

Possible impacts to the hydrologic features include increased sediment yield and reduced water output and quality from wells and springs. Downstream contamination is possible in certain areas, particularly on or near floodplains if an oil spill occurs.

Animals

Road construction and pad construction, resulting in habitat and forage loss and increased levels of human activity during all phases of oil and gas work would impact animals. Human intrusions into critical winter range or breeding areas during high use periods can have serious impacts on certain species.

Recreation

Only minor direct impacts are expected.

Visual Resource Management

Impacts would occur primarily in the long term. The badlands, scablands, and heavily forested areas are those most likely to be impacted. The field development phase would generate the greatest impacts with road building and pipeline construction being the major impact-causing actions.

Wilderness

Major impacts would be changes in the natural appearance of the landscape in the area and the loss of solitude resulting from oil and gas activity.

Prehistoric and Historic Features

Major impacts to cultural features could include loss of spatial association of artifacts and the destruction of the artifacts themselves, particularly in areas of known high site density.

Economic and Social Conditions

Economic and social impacts would center around population growth in communities which do not have excess housing and service (schools, sewage treatment, water supply, etc.) capacity. Peak impacts would occur during the labor intensive development phase.

Land Use

Land use impacts would involve conflicting land uses near communities which could experience expansion as a result of oil and gas activity and reductions in forage and agricultural production.

No Leasing

The following analysis discusses, by environmental component, the implications of discontinuing federal oil and gas leasing as an alternative to the proposed action. The reader may refer to the environmental impact assessment in Chapter 3 of the Miles City District Oil and Gas EA for a detailed analysis.

Geology

The impact to the geology resulting from no leasing could be a greater dependence on coal to make up the energy resource loss.

Soils

Impacts on existing, unexpired lease holdings would be identical to those described for the proposed action. It is likely that increased activity on unexpired federal leases could lead to greater soil related impacts than are now occurring. Impacts from geophysical operations would continue.

Vegetation

Drilling would continue for an unknown period on existing producing leases—perhaps for 20 years or more. Also, vegetation impacts would likely increase on surface underlain by private minerals. Impacts from geophysical exploration would continue even in the absence of federal leasing.

Water

Adverse impact upon the water resource could initially increase. Exploration activities would increase on existing leases in an attempt to discover oil and gas before the leases expired. The impacts associated with preliminary exploration, exploratory drilling, and development discussed for the proposed action are likely to increase substantially or at least become more concentrated prior to lease expiration.

Over a period of 8 to 10 years, exploration activity on existing federal lease holdings would decline. Eventually, after all existing leases expired, there would be no new impacts from exploration or development on lands over federal oil and gas subsurface. Impacts from production would continue until existing oil and gas fields were abandoned. Hydrologic impacts from geophysical activity would continue in the absence of federal leasing.

Animals

Discontinuing federal oil and gas leasing would create impacts comparable to those discussed for the proposed action, but at a smaller scale. Existing leases would be developed more rapidly and the impacts would continue until abandonment. The impacts of oil and gas leasing would continue, however, assuming that mineral leasing and development occurred (possibly at an accelerated pace) on private and state surface. Many species of wildlife are mobile creatures and, consequently, a private oil and gas production area adjacent to public lands would affect those species in the general area.

If leasing does not occur, there would be no effects upon the livestock using lands overlying federal oil and gas estates.

Recreation

If federal leasing does not occur, there would be no impacts on recreation beyond those associated with normal population growth.

Wilderness

This alternative would have a beneficial impact on wilderness values by removing the potential for disturbing the solitude and naturalness of the area.

Visual Resource Management

Where small parcels of land overlying federal oil and gas domain are not leased within areas of nonfederal intensive oil and gas activity, a contrast between those parcels and the developed area would occur. This contrast would be virtually unnoticeable because of the character of oil and gas fields and the dispersion of unaffected areas within a developed field. For these small parcels, the nonleasing of federal oil and gas subsurface would have a negligible effect on the appearance of the area as a whole.

Where larger blocks of lands overlying federal subsurface occur, the effect of nonleasing would be a lack of change in the visual surface of the land except where public lands abut developed private lands. The effect of adjacent lands on overlying federal oil and gas subsurface would be negative; the effect on public lands of other character would be neutral.

Prehistoric and Historic Features

The only impacts to cultural features anticipated in the absence of federal leasing are those identified for the proposed action concerning geophysical exploration. These would occur since geophysical operations would continue even in the absence of federal leasing.

Economic and Social Conditions

Based on FY 1978 production data, discontinued leasing of federally owned oil and gas resources in the Miles City District would result in an annual loss of 30.31 trillion BTUs of fossil fuel energy (1.69 trillion BTUs of gas and 28.62 trillion BTUs of oil).

Because of the close relationship between energy consumption and economic activity, this energy loss would either result in a reduction of the United States' gross national product, an increase in energy impacts, an increase in the use of alternate fuels such as coal and nuclear energy, or an increase in petroleum imports. Past relationships between energy consumption and gross national production in the United States indicate that approximately 73,000 BTUs are required for every dollar of gross national product. Based upon a linear relationship between gross national product and energy consumption, it is likely that the United States' gross national product could be reduced by $415.19 million as a result of the loss of 30.31 trillion BTUs of petroleum and natural gas energy (if not replaced by other energy sources). This loss would represent a reduction of .02% in the nation's 1977 gross national product. Using gross national product to jobs coefficients, this could mean a loss of approximately 3,700 jobs nationwide (roughly .24% of total 1977 national employment).

There could be a loss of jobs locally resulting from curtailment of federal oil and gas leasing activities. Assuming that 1978 production levels on government oil and gas leases would continue into the future, it is estimated that approximately 146 jobs could be lost in the Miles City District as a result of discontinuation of federal oil and gas leasing. In addition, there would be secondary (i.e., indirect) employment losses in the Miles City District and elsewhere if the estimated 146 direct jobs and associated annual payroll of approximately $2,628,000 (146 x $18,000) are lost. The U.S. Treasury and the State of Montana would lose $8.7 million per year in bonuses, royalties, and rentals (FY 1978 data) from the Miles City District if past levels of federal oil and gas activity are precluded in the future as a result of this alternative.

The State of Montana assesses a severance tax on oil and gas operators. The 1978 rate was 2.65% of gross value on natural gas and 2.65% of gross value of oil in excess of $6,000 (2.1% on oil of less than $6,000 gross value). If federal oil and gas production were eliminated in the Miles City District, this would result in a loss to the State of Montana of approximately $1,143,072 annually in oil severance tax revenue and $10,900 in natural gas severance tax revenue (1978 data).

It should be understood that these estimates are based upon 1977 and 1978 data, and upon the assumption that nonfederal oil and gas activity would not change as a result of this alternative.

Land Use

This alternative would mean that BLM lands would be available for other public purpose uses such as agriculture and livestock production, wildlife, and recreational uses. However, no leasing by the federal government could affect leasing on private lands in cases where subsurface is necessary for efficient exploration and development activities.

Discontinuing oil and gas leasing on public lands would not significantly affect the Bureau's policy of granting rights-of-way for energy related purposes. Providing the companies could comply with the necessary mitigation designed to protect public resource values, rights-of-way for transportation and access would continue to be granted on a frequent basis; however, the demand for rights-of-way and ancillary uses would be lessened under a no-leasing policy.

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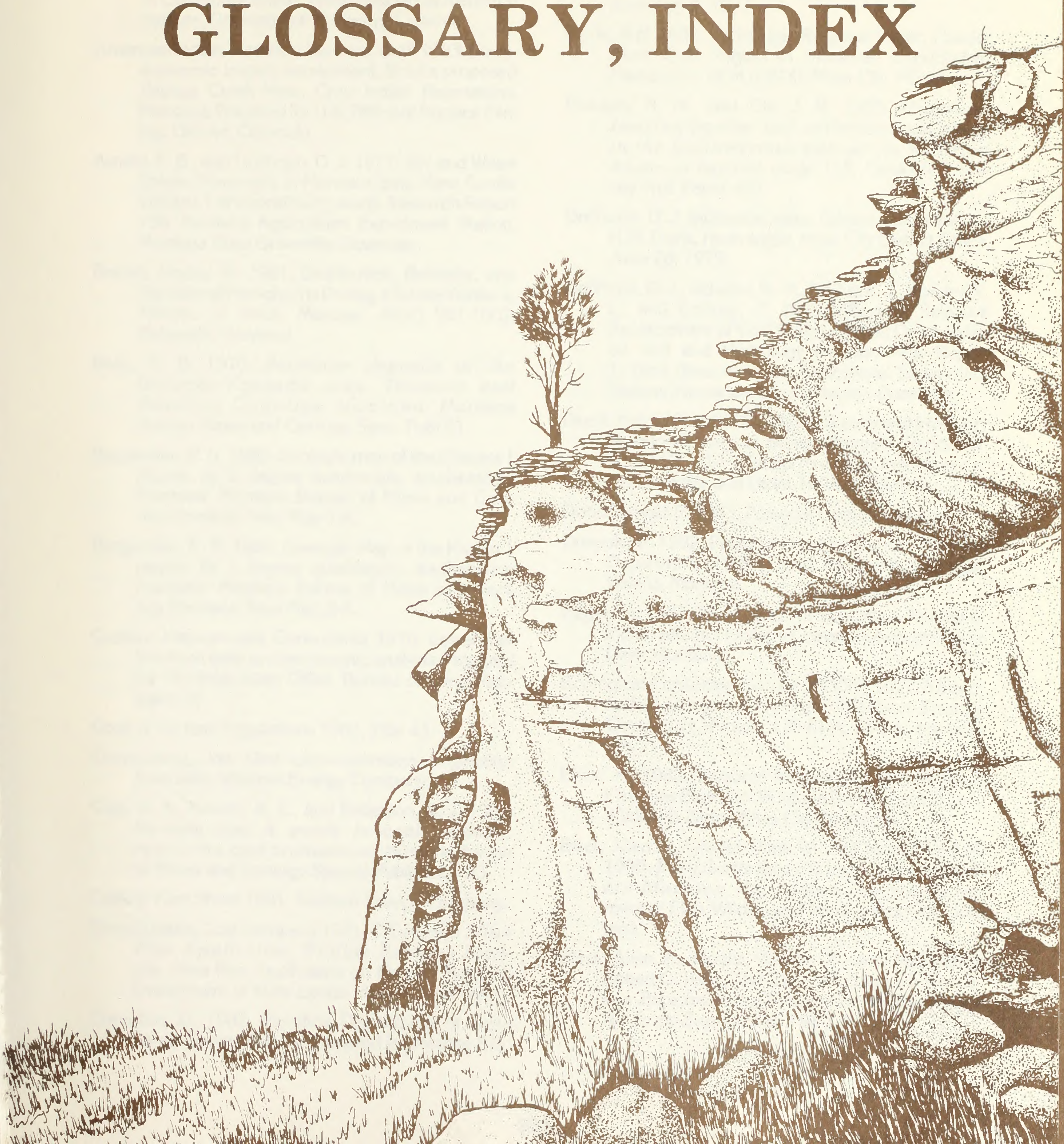

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GLOSSARY

ACTIVITY PLAN—A site specific plan for the management of one or more resources. Activity plans implement decisions made in the Resource Management Plan.

ALLOTMENT—An area of land where one or more livestock operators graze their livestock. Allotments generally consist of BLM lands but may also include state-owned and private lands. An allotment may include one or more separate pastures. Livestock numbers and seasons of use are specified for each allotment.

ALLOTMENT MANAGEMENT PLAN (AMP)—A written program of livestock grazing managment, including supportive measures if required, designed to attain specific management goals in a grazing allotment.

ALLUVIAL VALLEY FLOOR—The unconsolidated stream-laid deposits holding streams where water availability is sufficient for subirrigation or flood irrigation agricultural activities but does not include upland areas, which are generally overlain by a thin veneer of colluvial deposits composed chiefly of debris from sheet erosion, deposits by unconcentrated runoff or slopewash, together with talus, or other mass-movement accumulations and windblown deposits.

ALLUVIUM—Unconsolidated clay, silt, sand, and gravel which has been deposited in valley floors by stream action.

ANIMAL UNIT MONTH (AUM)—A standarized measurement of the amount of forage necessary for the complete sustenance of one animal for one month; also, the measurement of the privilege of grazing one animal for one month.

AQUIFER—A formation, group of formations, or part of a formation that contains enough saturated permeable material to yield significant quantities of water to wells and springs.

AREA OF CRITICAL ENVIRONMENTAL CONCERN (ACEC)—Area within public lands where special management attention is required to protect and prevent irrepairable damage to important cultural, historical, or scenic values, fish or wildlife resource, or other natural system or processes, or to protect life and safety from natural hazards.

BASE FLOW—That portion of the stream discharge derived from groundwater outflow or other sources outside the net rainfall which created the surface runoff.

BRITISH THERMAL UNIT (BTU)—The amount of heat required to raise the temperature of one pound of water one degree Fahrenheit.

COAL WITH DEVELOPMENT POTENTIAL—Coal with overburden of 500 feet or less, a stripping ratio of 15:1 or less, and a seam thickness of five feet or greater.

CRITICAL WILDLIFE HABITAT—The area of land, water and airspace required for the normal needs and survival of wildlife species of special concern.

CULTURAL RESOURCES—A term that includes items of historical, archaeological or architectural significance which are fragile, limited and nonrenewable portions of the human environment.

EMARS—Energy Minerals Activity Recommendation System: an integrated planning process for coal lease sales that involved annual nominations by industry and the public of areas where coal should not be leased. The program was adopted in 1975 but discontinued in 1977 as a result of the NRDC versus Hughes court decision, which found the EMARS Programmatic EIS inadequate. New laws and planning requirements resulted in a revised coal program and EIS being issued in 1979.

EMERGENCY COAL LEASE—A noncompetitive lease issued on application to a mining company under the provisions of 43 CFR 3425.1-4. These provisions allow for such leasing to: 1) maintain an existing mining operation at its current average annual level of production or to supply coal for contracts signed prior to July 19, 1979; or 2) to avoid the coal deposits being bypassed for mining in the reasonably foreseeable future. The need for the coal must have resulted from circumstances unforeseen or beyond the control of the applicant and the amount leased is limited to eight years worth of production.

EPHEMERAL STREAM—A stream that flows only in direct response to precipitation and whose channel is at all times above the water table.

EVAPOTRANSPIRATION—The volume of water evaporated and transpired from soil and plant surface per unit land area.

GEOMORPHIC STABILITY—The resistance of a landform to change.

HUNTER HABITAT—Habitat that sustains a significant wildlife population where hunters can expect to locate game.

HUNTER ACCESS PROGRAM (S-60)—A BLM program that allows a private landowner to permit hunting on private land in lieu of hunting on public land.

INFILTRATION—The flow of a fluid into a substance through pores or small openings; connotes flow into a soil, in contrast with percolation, which connotes flow through a porous substance.

INTERMITTENT STREAM—A stream that carries water most of the time, or over most of its course, but ceases to flow occasionally.

ION—An atom or molecule which by loss or gain of one or more electrons has acquired a net electric charge.

LEASE—A contract by which interests are created or transferred to another for a specified period. All except recreation and public purpose leases require consideration of rent or some other compensation.

LIGNITE—Coal with BTU values of less than 8,300 per pound, on a moist, mineral-matter free basis.

LITHOLOGY—The chemical and physical composition of rock.

LOCATABLE MINERALS—Generally the metallic minerals subject to development specified in the Federal Mining Law of 1872; within the resource area, includes bentonite, gypsum, uranium minerals.

MANAGEMENT FRAMEWORK PLAN (MFP)—A planning decision document that establishes for a given area, land use allocations, coordination guidelines for multiple use or protection. It is the BLM's land use plan. An MFP is prepared in three steps: (1) resource recommendations, (2) impact analysis and alternative development, and (3) decision making.

MECHANICAL TREATMENT—Treatment by mechanical means of an area of range including contour furrowing, pitting, plowing and seeding, chiseling, scalping, etc.

NOXIOUS WEED—A weed arbitrarily defined by law as being especially undesirable, troublesome, and difficult to control. Definition of the term varies according to legal interpretations.

PERENNIAL STREAM—A stream that flows continuously or year-round.

PREFERENCE (GRAZING)—The total number of animal unit months of livestock grazing on public lands apportioned and attached to base property owned or controlled by the operator.

PORE VOLUME—The volume of the interstices or pores in a material, such as rock or soil. When saturated, these empty spaces are filled with water. This amount of water is called a pore volume of water.

PRE-FLPMA LEASES—Oil and gas leases issued prior to the passage of the Federal Lands Policy and Management Act of 1976. Where occurring in Wilderness Study Areas, these leases have valid existing rights, which allow development even if wilderness values may be impaired.

PREVENTIVE SIGNIFICANT DETERIORATION (PSD)—A planning and management process for allocation and use of air resources. Maximum allowable increases in air quality over baseline concentrations for sulfur dioxide and particulates are set for each area within the state, based upon its classification: Class I, Class II or Class III. The maximum allowable increases or increments cannot be exceeded by a new source or by a modification to an existing source which emits sulfur dioxide particulates.

PROPER USE—The degree and time of use of the current year's plant growth which, if continued, will either maintain or improve the range condition consistent with conservation of other natural resources.

RENEWABLE RESOURCES—All of the products and physical values produced or continued within BLM lands which could be restored or replenished as they are used (e.g., wildlife, vegetation, water). Does not include resources such as minerals, soils, cultural artifacts, which are gone once used or destroyed.

RIPARIAN AREA—A specialized form of wetland with characteristic vegetation restricted to areas along, adjacent to or contiguous with rivers and streams, also, periodically, flooded lake and reservoir shore areas, as well as lakes with stable water.

SALEABLE MINERALS—Common varieties of mineral materials such as sand, stone, and gravel, as well as petrified wood. Unlike leaseable or locatable minerals, common mineral materials may be sold or disposed of through free use permits under the provisions of the Materials Act of July 31, 1947, amended by the acts of July 23, 1955, and September 25, 1962, (30 USC 601, 602).

SCALPING—Removing 10 to 25-inch wide strips of native vegetation and leaving undisturbed strips between. This mechanical treatment speeds range improvement by retaining rainwater and snowmelt and by reducing competition to desirable species from a dense stand of less desirable vegetation.

SODIUM ADSORPTION RATIO (SAR)—An expression of relative activity of sodium ions in exchange reactions with soil, indicating the sodium or alkali hazard to soil.

SPRING REST/DEFERMENT—The withholding of livestock grazing in the spring to provide for plant reproduction, establishment or vigor recovery.

SUBBITUMINOUS—Nonagglomerating coal with BTU values ranging from 8,300 to 11,500 per pound, on a moist, mineral-matter free basis.

THREATENED OR ENDANGERED SPECIES—Determined for plants and animals by one or a combination of the following factors:

1. The present threatened destruction, modification or curtailment of a species habitat or range.
2. Over-utilization of a species for commercial sporting, scientific or educational purposes.
3. Disease or predation of the species.
4. The inadequacy of existing regulatory mechanisms.
5. Other natural or human-caused factors affecting a species' continued existence.

TOTAL DISSOLVED SOLIDS (TDS or DS)—The dry weight of dissolved material, organic and inorganic, contained in water or waste. Dissolved solids cannot be removed by filtration, and excessive dissolved solids makes water unpalatable for drinking and unsuitable for industrial use. Generally reported in mg/l.

TOTAL SUSPENDED PARTICULATES (TSP)—Any solid substance present in water in any undissolved state, usually contributing directly to turbidity. Suspended material can be removed by filtration generally.

UNSUITABILITY CRITERIA—The 20 criteria described at 43 CFR 3461.1, the application of which results in an assessment of federal coal lands as suitable or unsuitable for all or certain methods of surface coal mining.

VEGETATION MANAGEMENT—Control or change of the vegetation resource which results from purposeful actions of other activities i.e., livestock, wildlife management.

VEGETATION MOSAIC—The natural plant community structure as it exists prior to any land disturbing activity.

VISUAL RESOURCE MANAGEMENT—Consideration of actions that may affect existing landscapes. Considered are the kinds of artificial structures and modifications which are acceptable to meet established visual goals.

VISUAL RESOURCES—The land, water, vegetation, animals, and other features that are visible.

WILDERNESS CHARACTERISTICS—The definition contained in Section 2(c) of the Wilderness Act (78 Stat. 891). These include size, naturalness, outstanding opportunities for solitude or a primitive and unconfined type of recreation and special features.

WILDERNESS STUDY AREA—A roadless area which has been found to have wilderness characteristics and subjected to intensive analysis in the Bureau's planning system and public review to determine wilderness suitability, and is not yet the subject of a Congressional decision regarding its designation as wilderness.

WILDLIFE MITIGATION—The planned lessening of adverse effects on wildlife habitat or populations resulting from a proposed project or action.

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1984
RESOURCE MANAGEMENT PLAN MAP OF

ALTERNATIVE A
(EAST HALF)

Powder River Resource Area
MILES CITY DISTRICT
MONTANA

LEGEND

🟩 Rangelands To Be Improved

🟧 Land Areas Categorized For Possible Disposal

▨ U.S. Forest Service Lands

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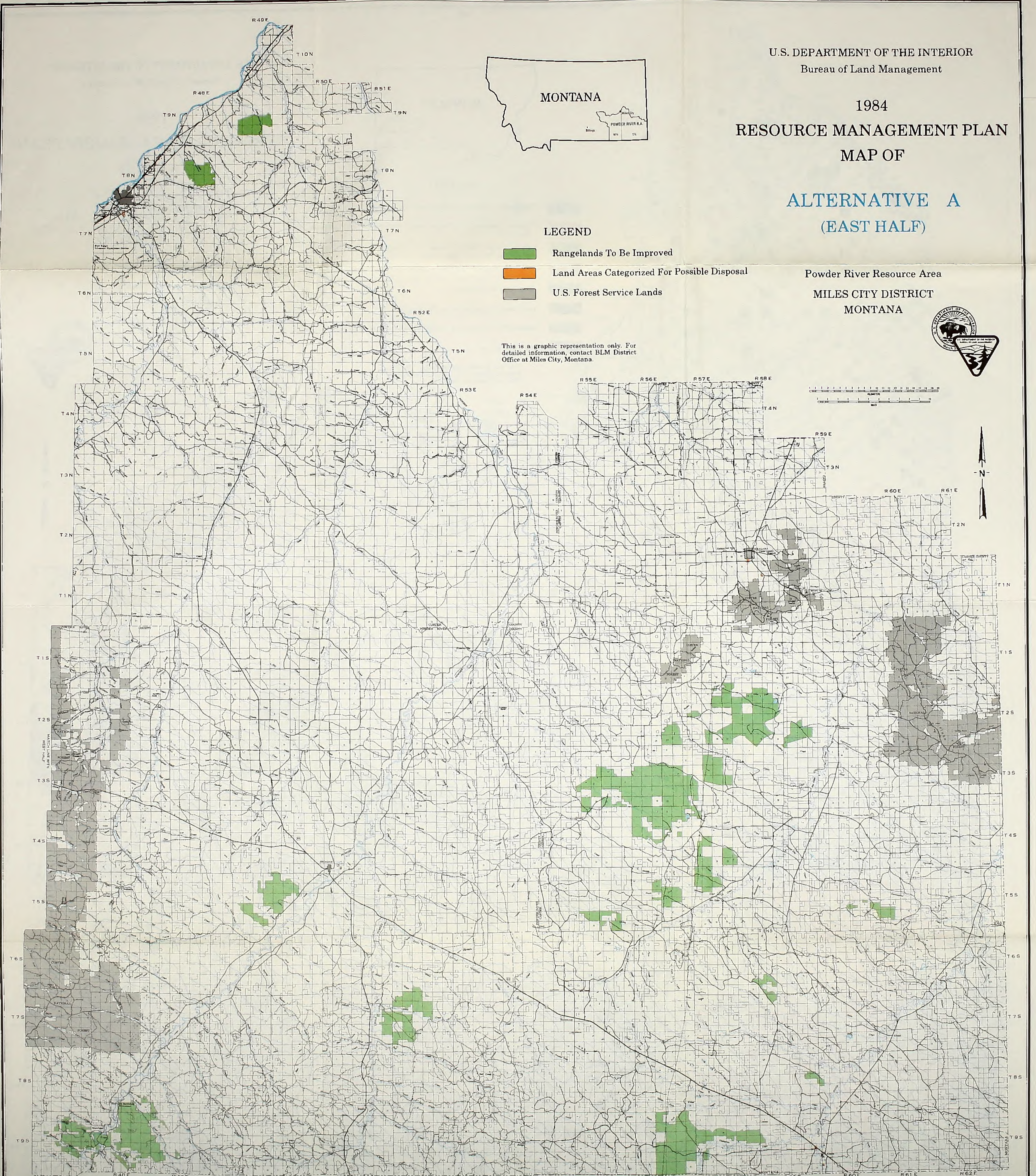

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RESOURCE MANAGEMENT PLAN MAP OF
ALTERNATIVE B
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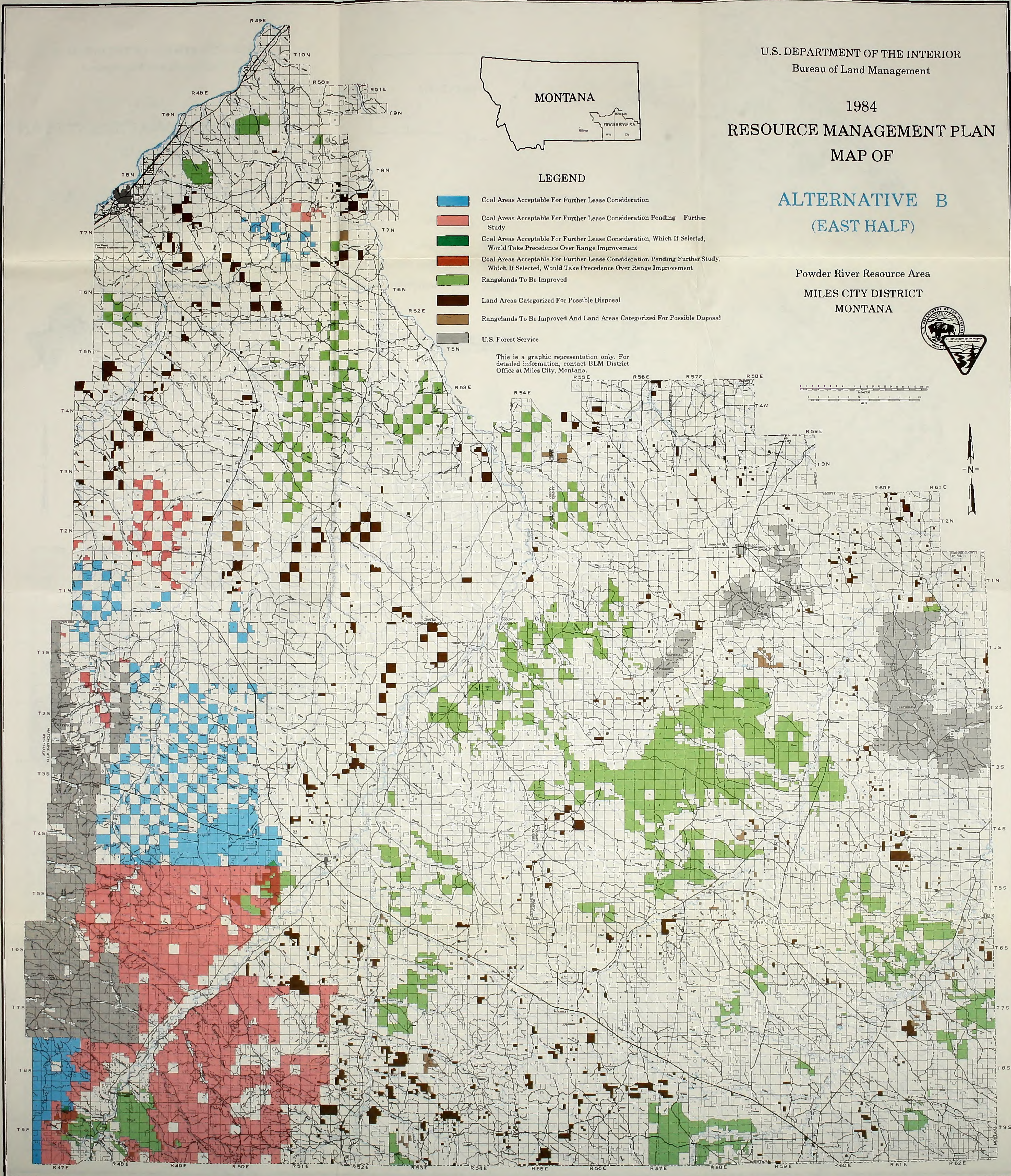
Powder River Resource Area
MILES CITY DISTRICT
MONTANA



LEGEND

🟦	Coal Areas Acceptable For Further Lease Consideration
🟥	Coal Areas Acceptable For Further Lease Consideration Pending Further Study
🟩	Coal Areas Acceptable For Further Lease Consideration, Which If Selected, Would Take Precedence Over Range Improvement
🟥	Coal Areas Acceptable For Further Lease Consideration Pending Further Study, Which If Selected, Would Take Precedence Over Range Improvement
🟩	Rangelands To Be Improved
■	Land Areas Categorized For Possible Disposal
🟫	Rangelands To Be Improved And Land Areas Categorized For Possible Diposal
▨	U.S. Forest Service

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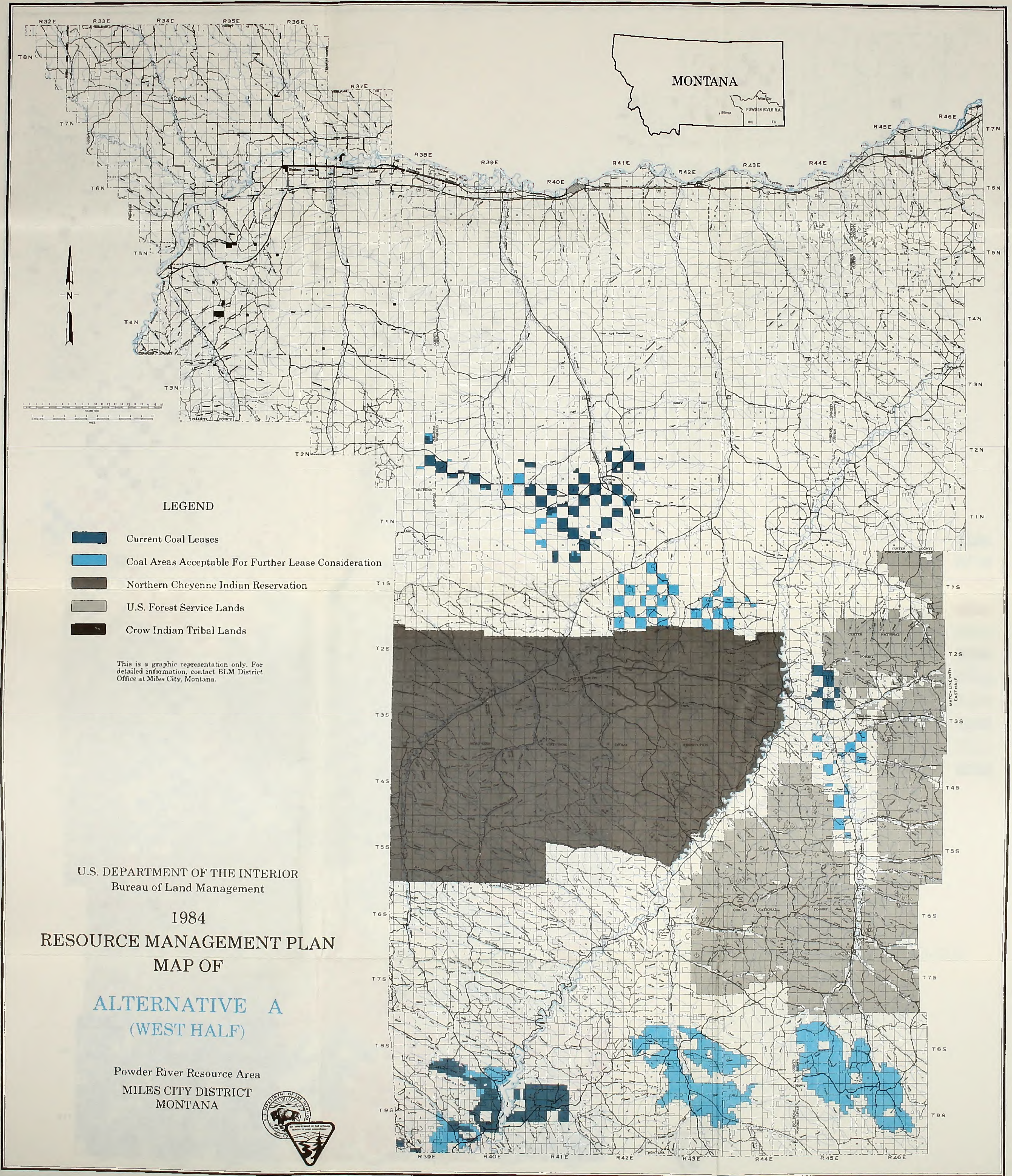

LEGEND

■ Current Coal Leases

■ Coal Areas Acceptable For Further Lease Consideration

■ Northern Cheyenne Indian Reservation

■ U.S. Forest Service Lands

■ Crow Indian Tribal Lands

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RESOURCE MANAGEMENT PLAN MAP OF

ALTERNATIVE A
(WEST HALF)

Powder River Resource Area
MILES CITY DISTRICT
MONTANA

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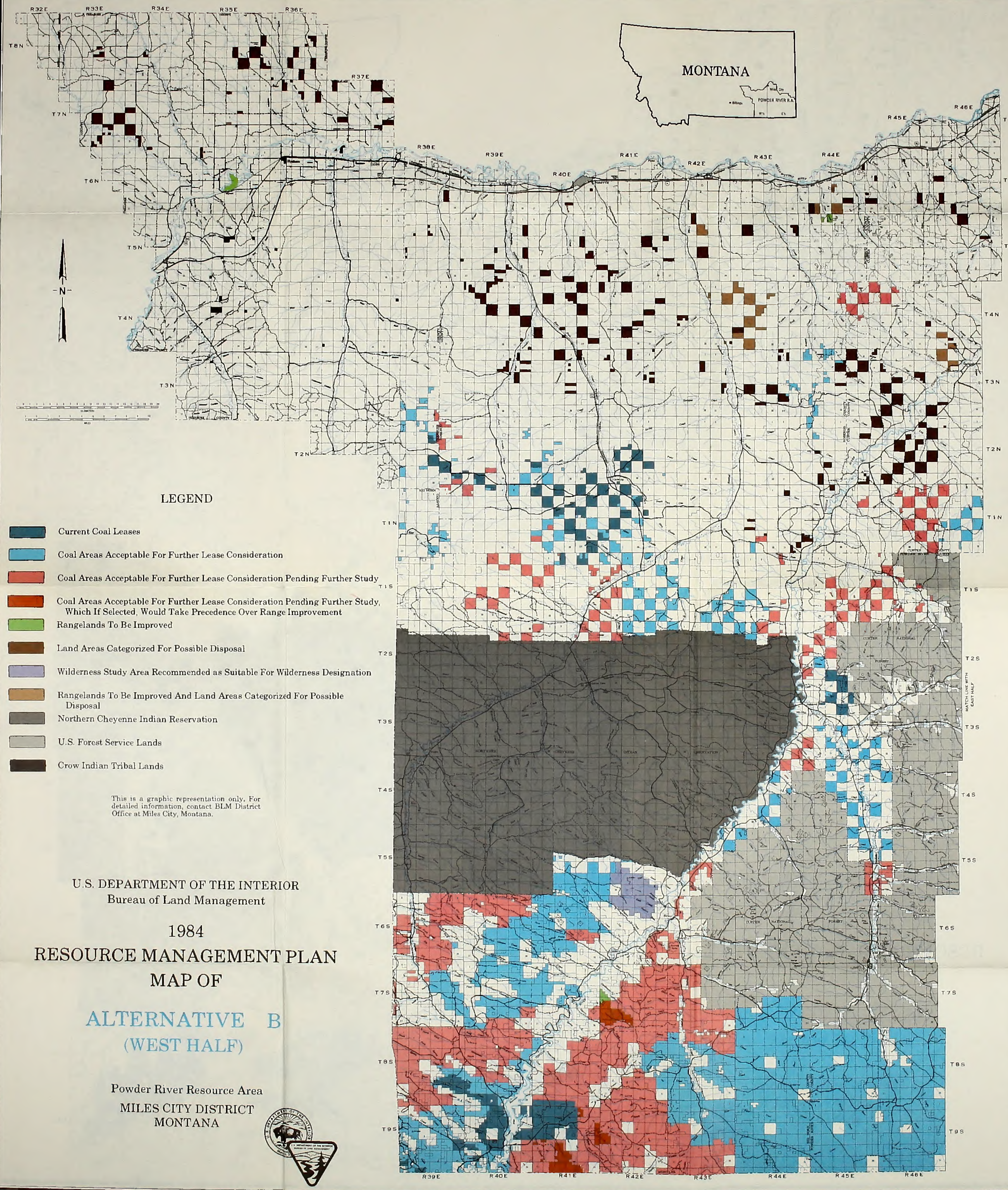

LEGEND

■	Current Coal Leases
■	Coal Areas Acceptable For Further Lease Consideration
■	Coal Areas Acceptable For Further Lease Consideration Pending Further Study
■	Coal Areas Acceptable For Further Lease Consideration Pending Further Study, Which If Selected, Would Take Precedence Over Range Improvement
■	Rangelands To Be Improved
■	Land Areas Categorized For Possible Disposal
■	Wilderness Study Area Recommended as Suitable For Wilderness Designation
■	Rangelands To Be Improved And Land Areas Categorized For Possible Disposal
■	Northern Cheyenne Indian Reservation
■	U.S. Forest Service Lands
■	Crow Indian Tribal Lands

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RESOURCE MANAGEMENT PLAN
MAP OF
ALTERNATIVE B
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Powder River Resource Area
MILES CITY DISTRICT
MONTANA

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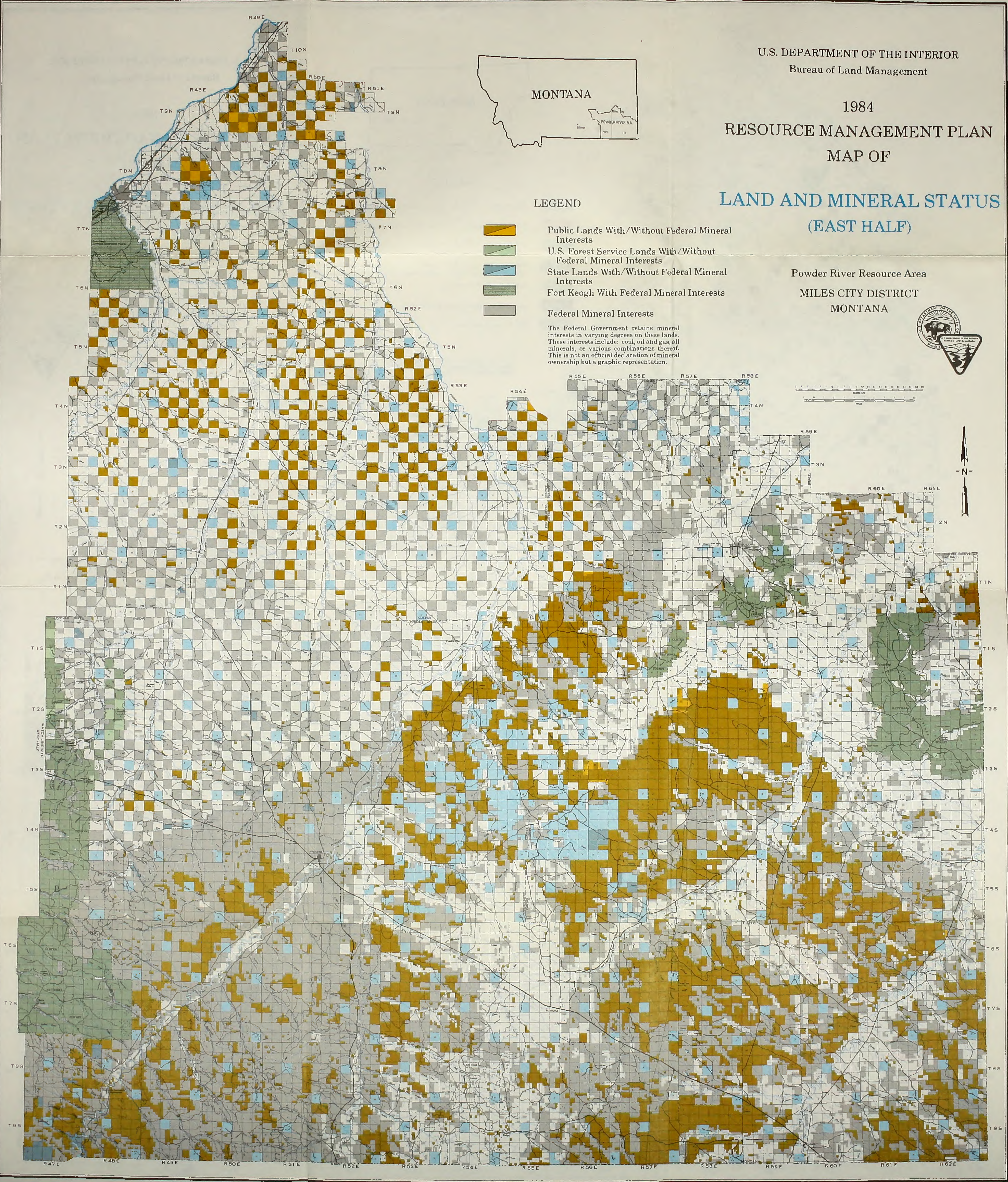
1984
RESOURCE MANAGEMENT PLAN MAP OF
LAND AND MINERAL STATUS
(EAST HALF)

Powder River Resource Area

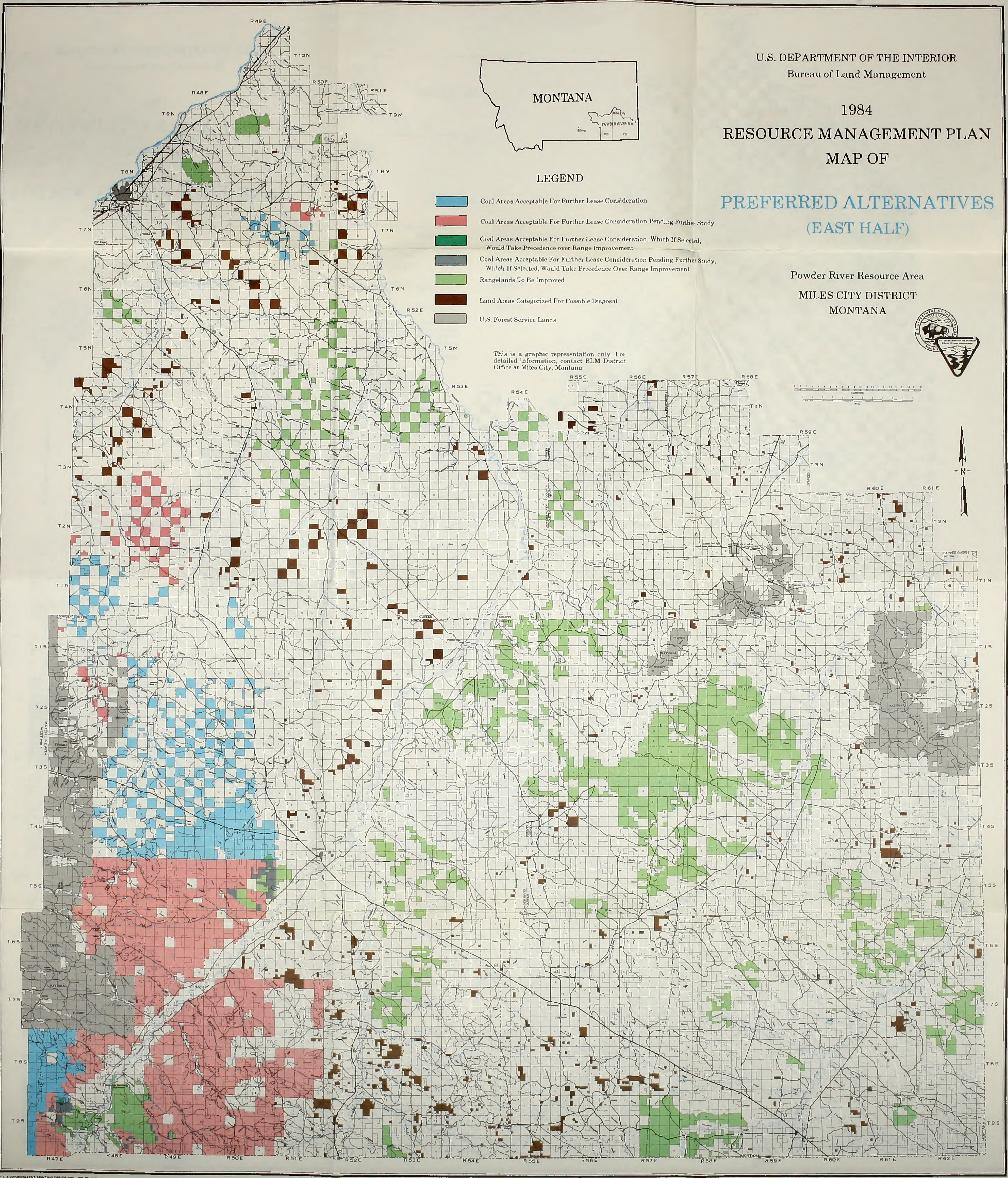
MILES CITY DISTRICT
MONTANA



LEGEND

- ▨ Public Lands With/Without Federal Mineral Interests
- ▨ U.S. Forest Service Lands With/Without Federal Mineral Interests
- ▨ State Lands With/Without Federal Mineral Interests
- ▤ Fort Keogh With Federal Mineral Interests
- ▩ Federal Mineral Interests

The Federal Government retains mineral interests in varying degrees on these lands. These interests include: coal, oil and gas, all minerals, or various combinations thereof. This is not an official declaration of mineral ownership but a graphic representation.



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1984
RESOURCE MANAGEMENT PLAN MAP OF
PREFERRED ALTERNATIVES
(EAST HALF)

Powder River Resource Area
MILES CITY DISTRICT
MONTANA

LEGEND

🟦 Coal Areas Acceptable For Further Lease Consideration

🟥 Coal Areas Acceptable For Further Lease Consideration Pending Further Study

🟩 Coal Areas Acceptable For Further Lease Consideration, Which If Selected, Would Take Precedence over Range Improvement

⬛ Coal Areas Acceptable For Further Lease Consideration Pending Further Study, Which If Selected, Would Take Precedence Over Range Improvement

🟩 Rangelands To Be Improved

🟫 Land Areas Categorized For Possible Disposal

⬜ U.S. Forest Service Lands

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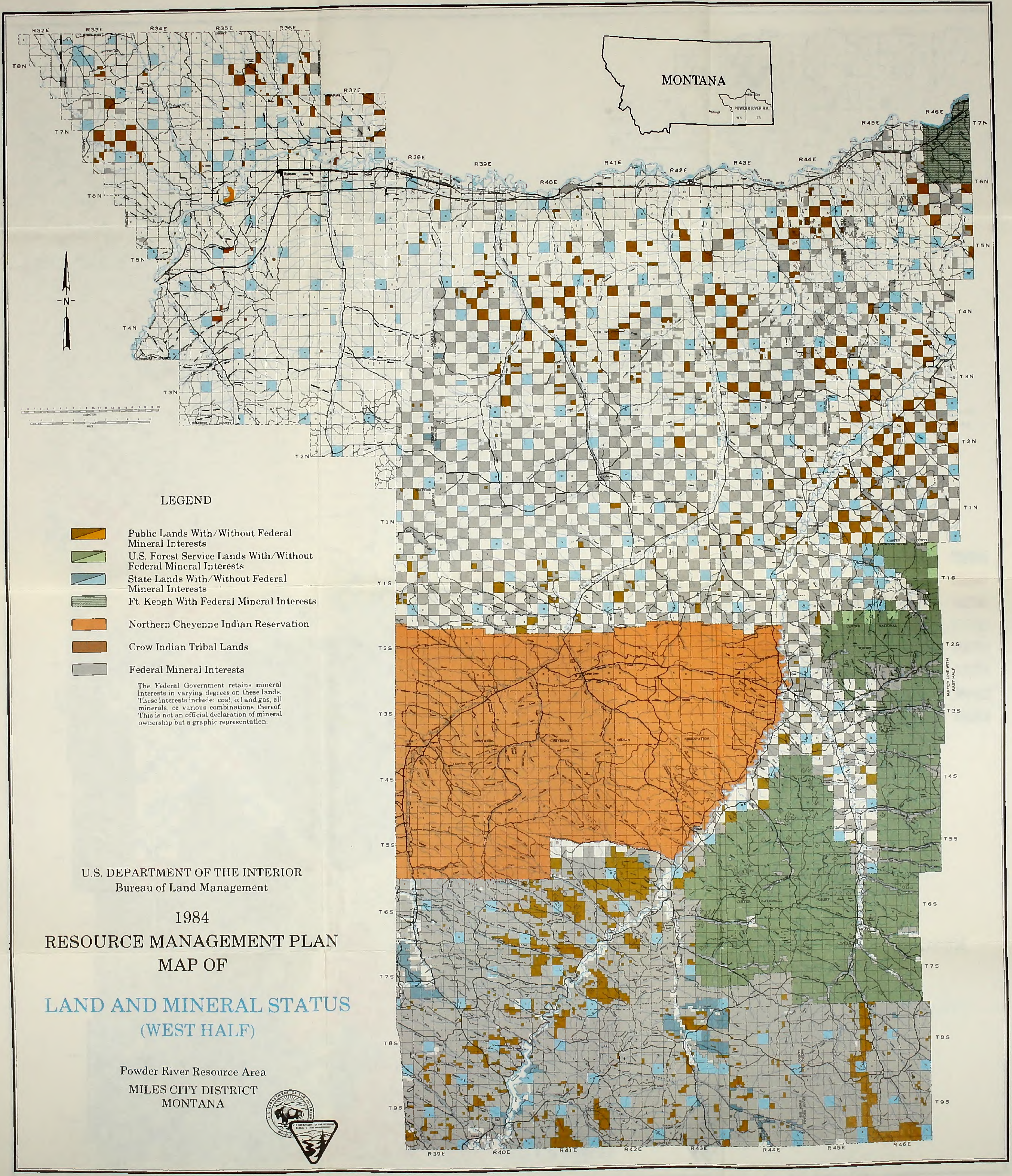

LEGEND

▨ Public Lands With/Without Federal Mineral Interests

▨ U.S. Forest Service Lands With/Without Federal Mineral Interests

▨ State Lands With/Without Federal Mineral Interests

▤ Ft. Keogh With Federal Mineral Interests

■ Northern Cheyenne Indian Reservation

■ Crow Indian Tribal Lands

■ Federal Mineral Interests

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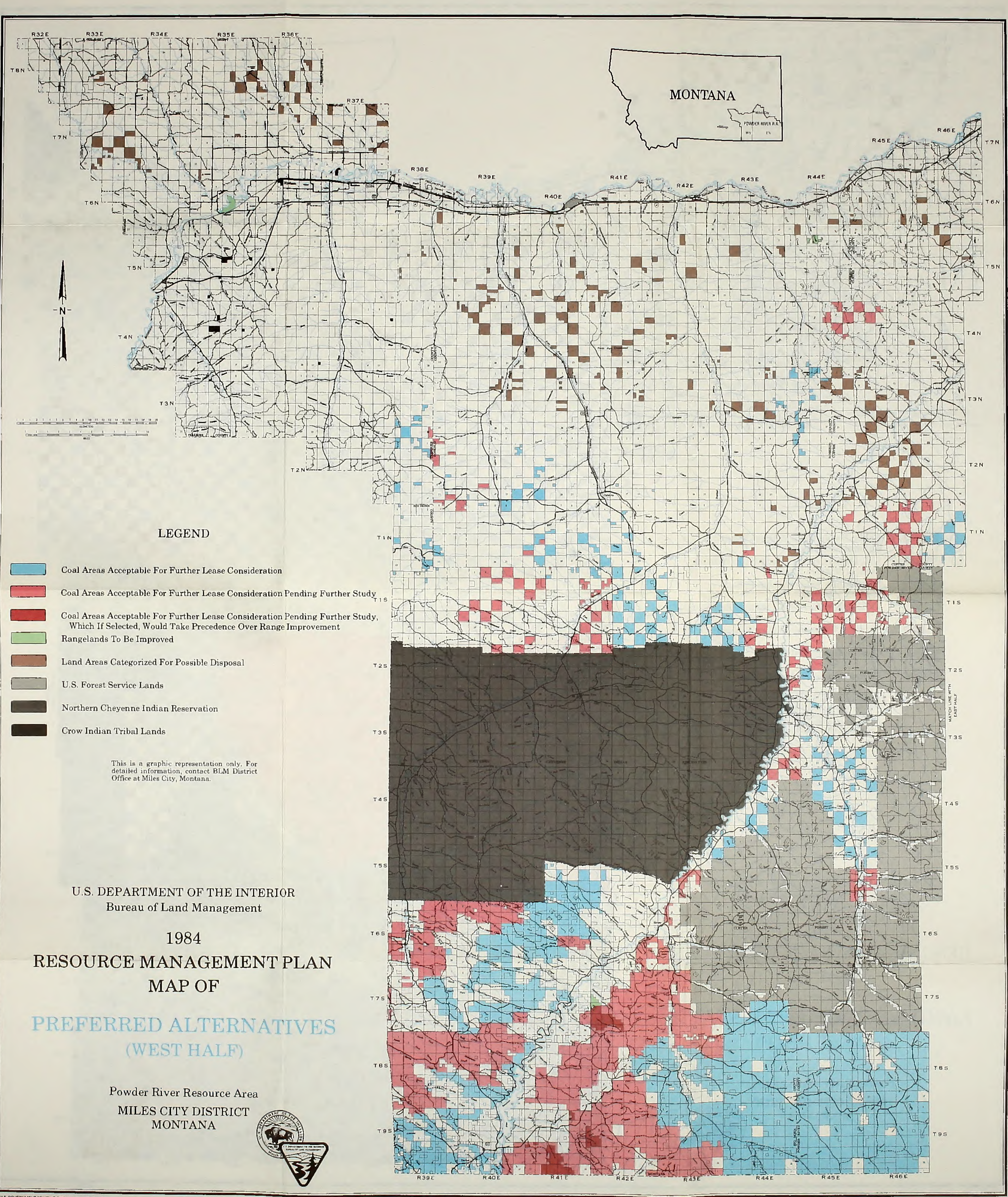

LEGEND

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- ⬛ Northern Cheyenne Indian Reservation
- ⬛ Crow Indian Tribal Lands

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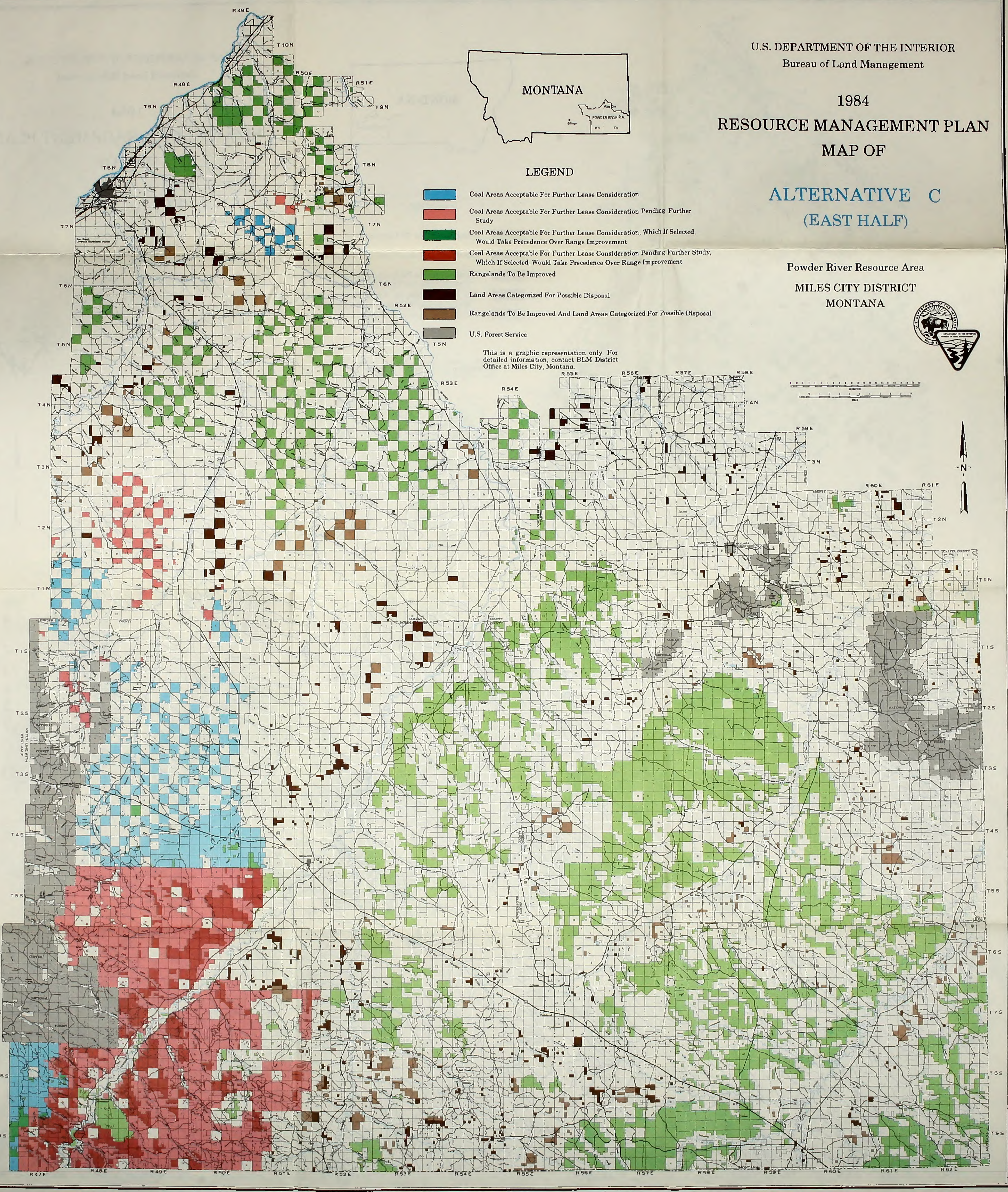
MAP OF

ALTERNATIVE C
(EAST HALF)

Powder River Resource Area
MILES CITY DISTRICT
MONTANA



LEGEND

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🟫	Rangelands To Be Improved And Land Areas Categorized For Possible Disposal
⬜	U.S. Forest Service

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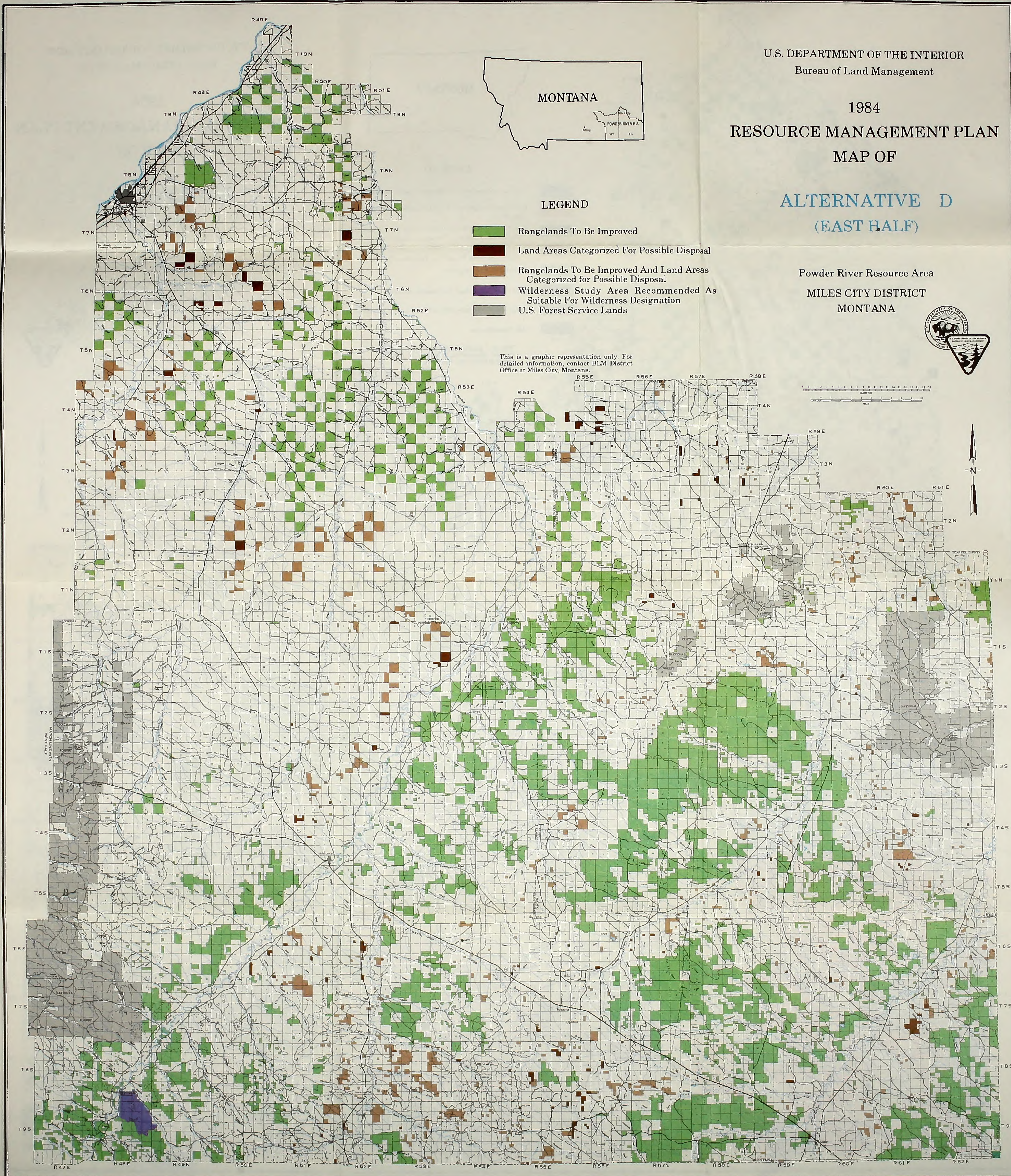

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ALTERNATIVE D
(EAST HALF)

Powder River Resource Area
MILES CITY DISTRICT
MONTANA

LEGEND

- 🟩 Rangelands To Be Improved
- 🟫 Land Areas Categorized For Possible Disposal
- 🟧 Rangelands To Be Improved And Land Areas Categorized for Possible Disposal
- 🟪 Wilderness Study Area Recommended As Suitable For Wilderness Designation
- ⬜ U.S. Forest Service Lands

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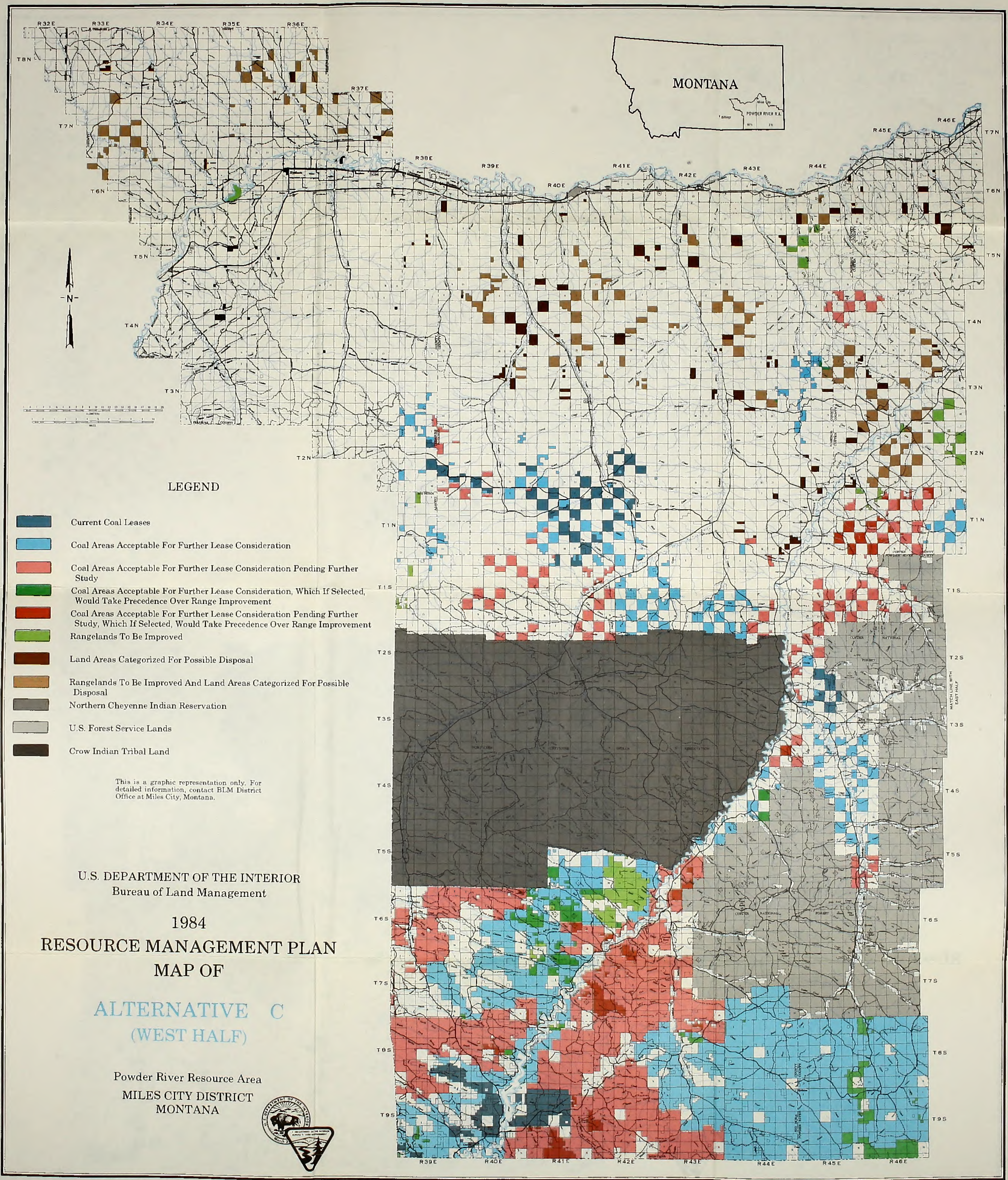

LEGEND

- 🟦 Current Coal Leases
- 🟦 Coal Areas Acceptable For Further Lease Consideration
- 🟥 Coal Areas Acceptable For Further Lease Consideration Pending Further Study
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- ⬜ U.S. Forest Service Lands
- ⬛ Crow Indian Tribal Land

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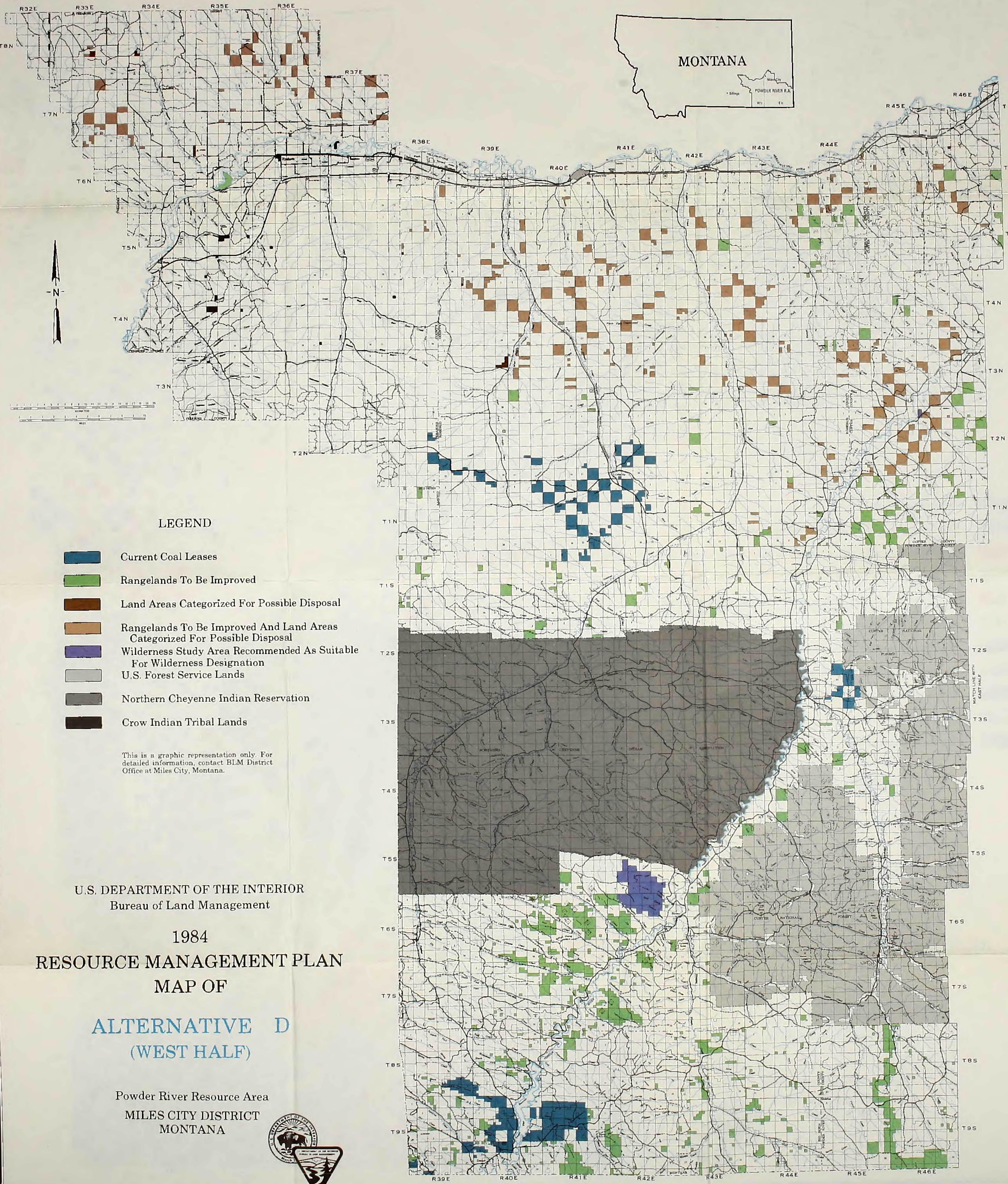

LEGEND

- 🟦 Current Coal Leases
- 🟩 Rangelands To Be Improved
- 🟫 Land Areas Categorized For Possible Disposal
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Powder River Resource Area

MILES CITY DISTRICT
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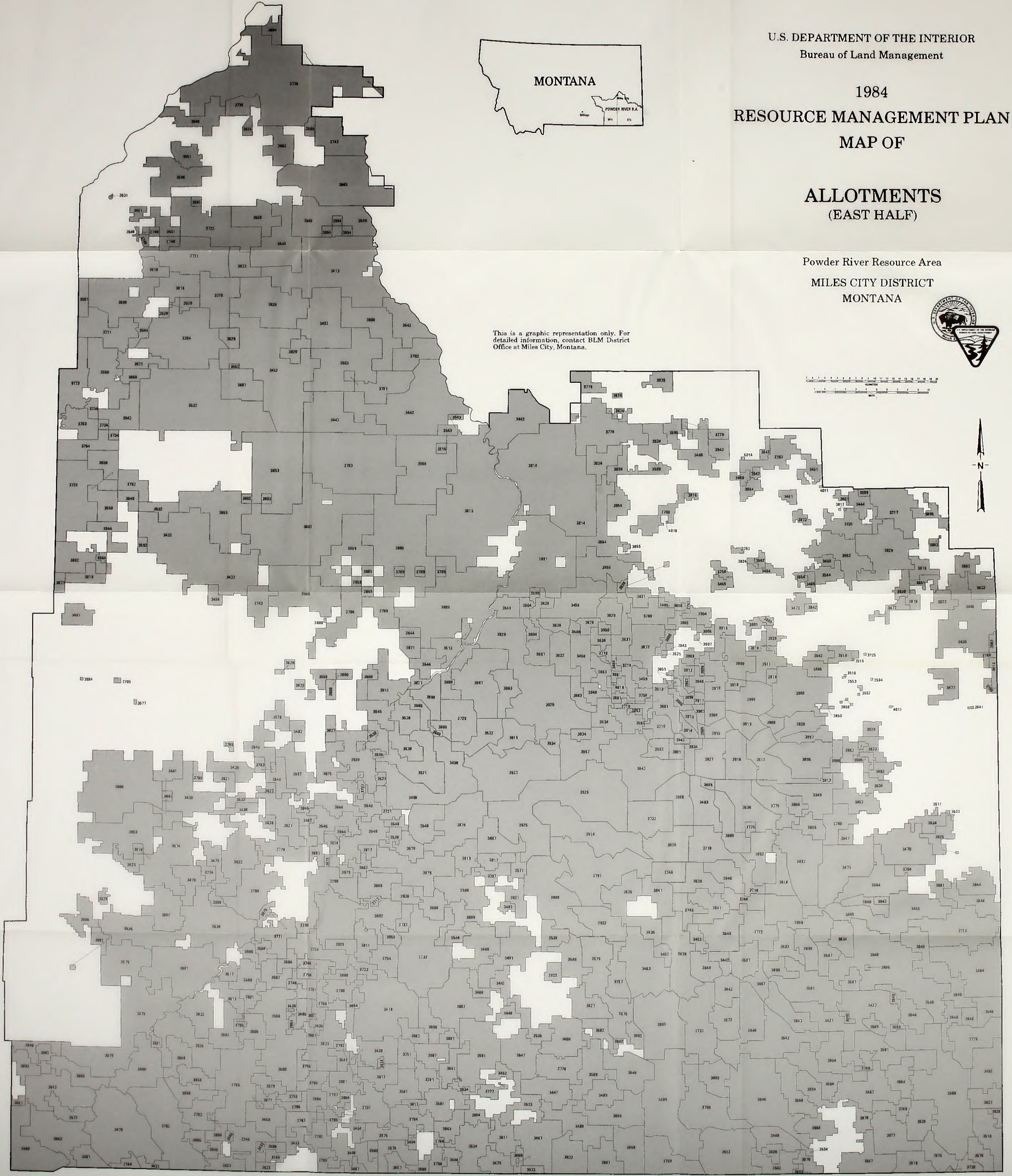

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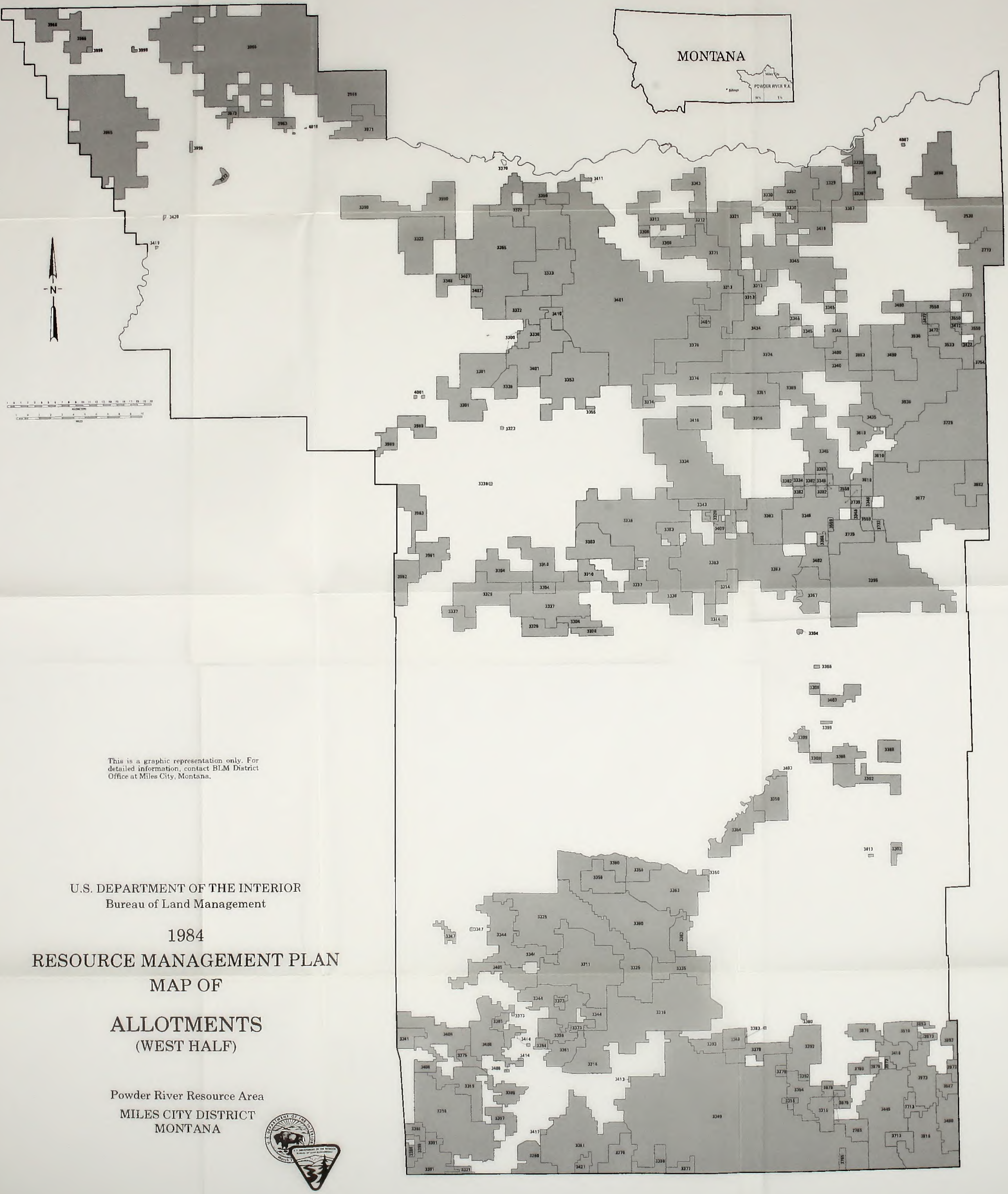

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